Some Prolegomena

to a

Philosophy of Medicine.

Giles F. Goldsbrough, M.D.

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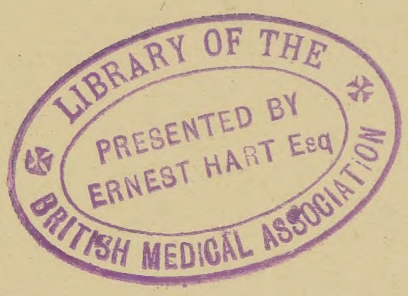
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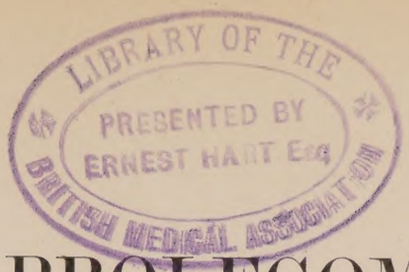

SOME PROLEGOMENA

TO A

PHILOSOPHY OF MEDICINE

BY

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PREFACE.

THE substance of the chapters constituting the present essay was delivered before the British Homœopathic Society as the presidential address for the session commencing in October last, and the essay is published in its present form by permission of the Council of the Society.

The occasion of the commencement of the present session was somewhat unusual, as the meeting of the Society took place, for the first time, in the new London Homœopathic Hospital, in Great Ormond Street; and hitherto it had been the custom for the President to give his annual address at the end of the session, instead of at the beginning. For these reasons, in addition to the main consideration stated in the introductory chapter, the author deemed the occasion most opportune for introducing the philosophical aspect of medicine given in this essay, which had been occupying his mind, in greater or less degree, for some years.

The author desires most sincerely to thank Dr. Hughes, Editor of the *Journal of the British Homœopathic Society*, for his kindness in revising the proof sheets, prior to the publication of the address in the Journal.

March, 1896.

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SOME PROLEGOMENA TO A PHILOSOPHY OF MEDICINE.

CHAPTER I.

Introduction.

The question often crosses the mind of the convinced homœopathist, why the majority of the profession refuse medical reform in the direction of an avowed and general adoption of the homœopathic rule or method. The medical mind is open to advances in knowledge in all other branches, which are the foundations of practice—medical or surgical. Even pharmacology, although with little generalised system, has found a place among the sciences of medicine. But, when the schools arrive at therapeutics, there is a steady, point-blank refusal even to inquire into a method, which is really simple when once conceived, practically universal as far as the uses of drugs are concerned, and verified by the experience of a large body of medical men throughout the world.

What is the fundamental reason of this attitude—apart, I mean, from wilful ignorance or misrepresentation? I cannot believe that men who have open minds to the new facts of other sciences, can simply be blindly led by bigotry or partisanship when they come to consider a branch of knowledge most nearly concerning their success as practitioners, and their reputation as honest, open-minded observers and seekers after truth.

The reason lies, as it seems to me, in the fact that as far as the current knowledge of physiology and pathology goes (and therapeutics are rationally based on these sciences), the homœopathic method or rule is ultra-rational, or ultra-scientific. What are the facts on both sides? Take those first of physiology and pathology. The object of physiology is stated by Landois and Sterling[1] to be the establishment of the phenomena of organisms, to determine their regularity and causes, and to refer them to the general fundamental laws of Natural Science, viz., the laws of physics and of chemistry.

And again, the whole series of phenomena of physiology considered as a *sign of life*, and termed metabolism, consist in the introduction, assimilation, integration, and excretion of matter.

With regard to pathology, Sir James Paget says, in Quain's "Dictionary of Medicine": "It is the name generally given to the science of disease, but the subjects which it may include cannot be exactly defined. For ease and disease, well and ill, and all their synonyms, are relative terms of which none can be defined unconditionally," and in a later paragraph, "Pathology finds in physiology its basis, the varying standards of healthy structure and functions with which its subject matters are in contrast, and the models and methods of its study; but its range is wider than that of physiology, inasmuch as the conditions giving rise to disease are much more numerous and more various than those of health." With regard to rational therapeutics, Dr. Lauder Brunton, in the same work, says, "that depending on experimental physiology and pharmacology, the practitioner may hope to recognise, from the symptoms of the patient, the organ affected by disease, the nature of the disturbance in its function, and to apply, with some degree of success, a remedy which will counteract such disturbance." Now it will be readily agreed that neither in physiology nor pathology, have we anything approaching simplicity of aim, or method, or result. In therapeutics, matters are still more confused.

[1] "Text-book of Physiology," vol. i., Introduction.

The conditions on which the single result desired, the cure of disease, depends, are known to be so complicated, that though based on facts from all the natural sciences, uncoordinated and unarranged, it is deemed rational to apply the bare notion of physical force, to bring about that result. Reason, we may well exclaim, but it requires an adjective to qualify it, the reason of blind force, it is true, but not of science either exact or even natural.

But turn to a similar line of facts relating to homœopathy. The ground-work of homœopathy is unquestionably the science of pharmacology or drug pathogenesy, as our classical work on the subject has it.[1] The methods of this science are those of experimental physiology, carried, in theory at least, to the finest degree in the human subject, with side-lights from experiments on animals.

In the application of the method of homœopathy, the facts of disease, in their simultaneity and succession and interdependence, are the only reliable phenomena which have to be dealt with as disease, and the rule of application between these phenomena and those of drug pathogenesy is the authority of a similar relationship. The authority of a similar relationship! What is that authority? Here we have the crux of the question. Two recent writers opposed to each other agree that the method does not "explain itself, and never can." Still, the grounds for the adoption of homœopathy are good, and by a long way higher than the roughly rational quasi-scientific methods of the predominant school. For the past hundred years, in the hands of observers equally competent to any in any field of science, in the phenomena of drug pathogenesy, and in the results of the treatment of disease by homœopathy, we have had, in process of collection, the concrete phenomena for the formation of a science of therapeutics, but the law which connects them has not as yet been defined.

Many analogies in the history of disease and its natural recovery, suggest that there is such a law, some among them having been brought forward by Dr. Madden in his presidential address at the recent Homœopathic Congress at

[1] "Cyclopædia of Drug Pathogenesy." Edited by R. Hughes and J. P. Dake.

Leeds.[1] A number of explanations have been offered, as you know, which are suggestive, but by no means conclusive, but we have no law to explain the operation of the *simillimum*, in the sense that gravitation is law, or in the sense of Ohm's law of electricity, or Bell's law of the sensory and motor functions of the roots of spinal nerves. The advocates of homœopathy, however, by the parallelism they draw between drug effects and disease, and by the universality of the application of one to the other they endeavour to establish, assert in effect, that the rule of similars must be based on a law of equal universality, if only such a law could be perceived, defined, and established in the mind.

Now this philosophical position of homœopathy places it higher in the scale of thought than the current philosophical bases of physiology, pathology, and therapeutics. As far as average science is concerned, homœopathy is therefore ultra-rational—it is beyond science. In the minds of those who are convinced of the practical value of the rule of similars in the treatment of disease, its scientific truth remains as a conviction, a belief, a faith, and there remains yet the necessity of formulating the basis of this conviction in philosophical relationship with other departments of medical knowledge.

What relationship, then, do the supporters of homœopathy bear to the dominant school? In view of the responsibility which attaches to the medical community in the treatment of disease, the relationship between the two spheres of thought is plainly ethical. Not the common ethical basis of professional etiquette. Far higher than that. On the one side, physiologists and pathologists, who are, at the same time, practitioners of medicine, *ought not* to close their eyes to the facts of experience, or the claims of a method which results in those facts, even though no explanation is forthcoming, and the facts run counter to received opinion or reason so far developed. And, on the other hand, men who have become convinced of the practical utility of the homœopathic rule *ought* to set forth their experience clearly and scientifically, in accordance with received and known con-

[1] *Homœopathic Review*, October, 1895.

clusions in physiology and pathology, and to spare no pains to discover, if possible, the law or laws on which the issue of those facts depends. This philosophical aspect of homœopathy is the main consideration, why I have chosen to address you on the subject of the philosophy of medicine this evening, and to give you the views which form the chief part of the following address. But before I do give you those views I should like to make a personal explanation respecting them.

These views did not arise in my mind, while endeavouring to find a scientific or rational explanation for the rule of similars, but while giving close consideration to another branch of philosophy. I make this explanation so that without "special pleading" I may emphasise the fact that I believe homœopathy may fall naturally into its place in a general philosophy of life and mind.

In the preparation of this address I have to gratefully acknowledge my indebtedness to a number of authors and works. For the scientific part, I have relied mainly on Quain's "Anatomy," the latest edition, edited by Professors Schäfer and G. D. Thane; Landois and Sterling's "Text-book of Physiology"; Quain's "Dictionary of Medicine"; and a little "Manual of Bacteriology," by Professor Klein. I must add to these the works of Hahnemann as translated by Dudgeon, and the writings of Hughes, Carroll Dunham, Drysdale, Hayward, H. R. Madden, and others. In philosophy, including psychology, I have taken much from the works of Bain and Spencer and William James. "The Protoplasmic Theory of Life," by the late Dr. Drysdale, has been a great help to me, as also, in philosophical purpose and method, a presidential address by Mr. Shadworth Hodgson, entitled, "Philosophy and Experience";[1] and various articles which, from time to time, have appeared in *Mind*.

[1] Williams and Norgate, 1885.

CHAPTER II.

Need and Conditions of Philosophy in Medicine.[1]

§ 1. The attainment of success is uppermost in the mind of every medical man. Success is what every man hopes for, and it is the only goal he can be satisfied with as a result of his study, his knowledge, and his practice. But the word must not have given to it a narrow or restricted meaning. Success does not include merely personal success. Such is the place medical men occupy in the social organism, that it is the welfare of the community they are bound to consider before their own. Although personal success does not fall out of consideration, it occupies distinctly a second place. It is wrapped up in the welfare or success of suffering humanity; or, we might say, it is on the relief of suffering humanity that medical success depends.

There is another aspect of success which must not be overlooked. As personal success depends on the welfare of the community, whom it is the duty of the medical man to serve, so does it also depend on the combined success of the whole profession. What is success for one man to-day, will be, by imitation, success for all to-morrow. What is success for the whole profession to-day, may be success for the single man to-morrow.

§ 2. This three-fold view of success may be illustrated by a reference to the possible experience of surgeons in the development of a major operation; taking ovariotomy for an example. In order to make the operation of ovariotomy a success the whole mind and interest of the surgeon are, for the time, intent upon the preparations, the instruments, and

[1] About half the paragraphs in this and the next section were omitted in delivery.

the manipulations required for its performance. On these, all combined, the condition of the patient being considered suitable, the successful result of the operation depends. The operation is performed; and is successful if the patient survives its actual performance. This is a personal success for the surgeon so far; and such success is not detracted from by the fact of the death of the patient after the operation, from any cause not directly ensuing from the fact of its performance. But if all patients died after the performance of that operation, even though every attention had been paid to ensure its successful performance, and the patients had survived the performance, the surgeon would not consider he had attained success in that operation, and he would seek for *an explanation of the reason why*. But supposing the experience of the particular surgeon was but the experience of all surgeons (which was, in fact, the case with ovariotomy before the introduction of antiseptics), the success of the one man would not be such a serious consideration to him personally, except in so far that in his own success was implied the success of the whole profession; and that the success of the whole profession would become one condition of the success of the single man.

§ 3. The illustration here used serves to point out the place of philosophy in medicine, and to suggest that the success of every man depends on his exercising a philosophical habit of mind. It was impossible that an operation like ovariotomy, which had aroused the keenest interest among surgeons, and which had in it all the elements of successful performance, could be allowed to drop. What was the process which raised it to its present position as not only a justifiable operation, but as a triumphant success to the community, to the profession, and to the individual surgeon?

This success depended in the first instance on *the explanations of failure*. The philosophy of the subject was brought into view by a re-examination of the facts and principles on which the operation had been based; these were found to be good in all save one most important particular. But this particular, the septic condition of wounds,

was being investigated in collateral fields; the method of antiseptics was introduced; it was tried in this operation with partial success, the inference of asepsis was drawn from partial failure under antisepsis, and now under asepsis and antisepsis the operation has become a success of which the whole profession, as well as the individual surgeon, might well be proud.

§ 4. It is an extension of the method of explanation in view of failure to attain success in every disease which makes possible a philosophy of medicine. If, in the face of failure and in the absolute necessity of success, and in the interest which a view of both failure and success excites in the mind, we have impelled a philosophical habit of mind which invites investigation of particular points, and by means of explanation, and the application of principles and inferences from different departments of knowledge, there ensues great practical advance in the direction of success—that is to say, that inferences of the mind are as real in themselves as the processes concerning which the inferences are made—it is a legitimate deduction that a proportionately great practical advantage would ensue if the process of explanation were so extended that a final explanation of all the explanations becomes possible. It also may be safely inferred that such an explanation may be as real as any of the explanations it seeks to explain (and they have been proved real by serving practical purposes); therefore, if the final explanation is real, it also will be conducive to success, relatively that through it all facts, causes, processes, and results included in both failure and success can be understood as they become objects of thought and relation by the mind.

If, on undertaking the consideration and treatment of a case of disease the practitioner of medicine or surgery knows precisely and definitely the relationship of causes, symptoms, and morbid anatomy so that a prognosis can with certainty be made, whether the case were left alone, or what would ensue if all available measures of treatment were adopted, he would look upon the consideration and treatment of such a case with perfect confidence or rest

of mind, provided always that recovery were the issue he knew would follow. The practitioner would be confident of success. It is confidence, or rest of mind, that is the goal of philosophy and that all understanding aims at, not rest in the sense of inactivity, but rest as preliminary to, and a basis of, increased personal activity. If a practitioner understands a case, he is in a position to treat it. His position is satisfactory philosophically. His knowledge furnishes his understanding with objective thought. Objective thought leads to the subjective act. The subjective act leads to further objective thought; the relation between the two sides of the shield is one of rest; and, as a final point, the rest of the practitioner of medicine is in philosophical relationship to his life and mind as a man among other men.

Thus we have set out the scope and purpose of philosophy in medicine. It begins with explanations of failure in single instances, and it ends by arriving at an explanation of the relationship of all medical knowledge to other knowledge, and also in what all knowledge consists, and on what it depends.

§ 5. An immediate practical inference may be drawn from a recognition of the wideness of a philosophy of medicine. The vastness of knowledge and the success which results from it, do not depend upon the knowledge and practice of one man but upon all. "Every man in his place," to the exercise of the highest and all his capacity, is as much a motto for the medical profession as for the ancient Hebrew army man. And every man who does what he can, cannot be done without. Whatever in the opinion of Mr. Herbert Spencer[1] may have been the ancestry of "physicians and surgeons," and by what process of evolution their descent down the ages has been accomplished, the point in evolution which interests them most is that they are here, they have arrived, and, *nolens volens*, they find themselves dependent on each other for the work they have to do.

[1] *Vide Contemporary Review*, June, 1895.

§ 6. In philosophy as applied to medicine as to any other department of knowledge, a distinction has to be drawn between philosophical method and scientific method. For a complete account of this distinction the reader is referred to Mr. Shadworth Hodgson's Aristotelian address entitled "Philosophy and Experience."[1]

Experience is the field both of philosophy and science, but in philosophy the question is asked, What is? as distinct from the question of science, How comes? and the question, What is? asked after the question, How comes? has exhausted the possibility of an answer. Science makes her answers first and then hands them on to philosophy for further investigation, and she puts again the question to each of them, What is? There are, however, two aspects of scientific investigation, and philosophy in reality deals with only one of them, and her results are applicable as explanations through one to the other. Philosophy explains through psychology to positive science and common-sense. Take as an illustration the ordinary common-sense idea of the cure of disease. Science asks, How comes it? Philosophy takes up the answers given and asks of each of them, What is it? Her answer can only be given in terms of science plus the personal experience of science. Even then the question may be re-asked of the answers given, What is it? And the answer given is the most final one that can be given. However often the question, What is? may be put, the nearest answer that can be given is a psychological or subjectively scientific one; therefore, if positive science and common-sense are treated philosophically they must be so through psychology or subjective reality.

§ 7. Hahnemann has said that "the physician's high and *only* mission is to restore the sick to health, to cure, as it is termed."[2] Some of the sick, however, cannot be cured, and it is a matter of common experience that they cannot. Where the structure of organs has been destroyed by disease—and such a contingency may arise in a moment of time—neither knowledge nor practice are of any avail to

[1] Williams and Norgate, 1885.

[2] "Organon of Medicine," § 1, translated by Dudgeon, 1893.

restore the sick to health, or *to cure* as it is termed. Thus, as well as asking *what is* the cure of disease, the mind cannot help asking, What is *incurable* disease? And so opens up at once one of the widest questions of the medical philosopher, What is disease at all? An attempted single answer to this question is not a primary one, however, and would not give much aid to a true solution of it.

But the common experience of disease and of incurable disease, also the discovered power to prevent some of the causes of disease, has led to further inquiry into the cause of all disease, and the aim to prevent it all. Hence is arrived at a further conception of the mission of the physician. He is the curer of disease; but he is also the preventer of disease. It is not, however, by an attempted answer to the question, What is the cause of all disease? that disease can be prevented: but in the scientific way of all true philosophy, the question is asked in a given instance, What is the cause of this? Having ascertained the cause of one, it can be correlated with others, and with the power to prevent them. So by a widening and deepening of knowledge of proximate causes with the ability to prevent some of them, the modern science of preventive medicine is being built up. It would not be very hazardous to prophesy that, as knowledge of disease and its causation advances, and as higher conceptions of responsibility in general human life emerge, the major consideration in medical practice will become the prevention of disease rather than its cure. The differentiation of medical knowledge into curative medicine and preventive medicine had not been made in Hahnemann's time, although he was fully alive to the importance of it when he says: "He (the physician) is likewise a preserver of health if he knows the things that derange health and cause disease, and how to remove them from persons in health."

§ 8. But we must enlarge the mission of the physician even yet. As we saw that the success of the single man depended so largely on the success of the whole profession, so the continued inevitable progress of the knowledge of the whole profession, and the modification of practice in accordance therewith, depends for its advance upon the observation

and practice of the single man. I need not enlarge on the detail of what such a conception of the mission of the single medical man involves. Broadly, it may be said, the education of the profession depends upon him. Although, in accordance with custom and best method, certain men are told off as teachers, and these find their places in colleges and universities, the facts of knowledge have to be gleaned first from the single case and group of cases; and the profession depends on every man to furnish some fact or facts to the common fund. How much this is the case may be noticed by a reference to the conditions under which medical education is conducted. The position occupied by hospitals, their relation to the medical schools, and the attitude of the State to both of them, are such that the responsibility for the record of facts is placed almost entirely upon the single man, or, at the most, on the voluntary association of men together, for the purpose.

§ 9. These three common conceptions; the cure of disease, the prevention of disease, and the education of the profession, thus indicate the experience which marks off the medical man from other individuals in the social community. We are, therefore, in a position to indicate the scope and limitations of a complete philosophy of medicine.

A philosophy of medicine will include a personal analysis, with results giving in psychological fact and arrangement all objects and branches of knowledge which can be included within the conceptions of the *prevention of disease*, the *cure of disease*, and of what is special in the acquisition or the imparting of knowledge included in these conceptions. Having made his analysis, the philosopher will be then in a position to bring his results to a psychological arrangement with each other, in the ordered system of his entire mental experience. He may become constructive. It will thus be perceived that philosophy is regarded as a process, a living and growing process, which can go on in the experience of every man, if he gives his attention to it; and, as we have gathered, the medical man is compelled, by the very nature of that experience, to engage somewhat in the philosophical process. A system of philosophy is the final result if the

philosophical process is pushed to the utmost limits the mind is capable of, which involves a final analysis and construction of itself, as the philosophising instrument.

It may, however, be added that inasmuch as knowledge is for ever growing, any system of philosophy, to be of value, must give an account of and allow for this growing process, or it will have little explanatory value except for the immediate present. It will soon be relegated to the limbo of forgotten thought.

And it must also be added, that what one man may do by way of a personal analysis and synthesis of his own knowledge, has a supreme value for himself alone, until he can set forth the process of his thought in language that may be used and understood by other minds, and by the association of this language in their own minds they are able to perceive and co-ordinate their own experience by his.

§ 10. In a series of prolegomena to a philosophy of medicine it must first be noticed, what are the special features in medical knowledge which distinguish it as knowledge from the ordinary every-day knowledge of people at large? And what are the special conditions of its acquisition?

Broadly stated, this distinction consists in the difference carried as far as possible between positive science and common-sense. In the education of students of medicine, it is necessary to attract attention away from the ordinary objects of experience and common-sense, and to fix it on an accurate and orderly presentation of the facts which are to form the content of his medical knowledge. But the difference does not lie here alone. In ordinary common-sense knowledge and experience, the conceptions of objects and relations between them and generalisations from them, of which this knowledge is built up, has a certain indefiniteness about it; the sensory impressions received from without have not had their utmost afferent discharge; they have been inhibited, partly by their multiplication and confusion together, partly by want of voluntary attention to one element or group of elements at a time, and partly by some other process in

consciousness, or a feeling of self. Common-sense knowledge, however, serves the ordinary every-day requirements of man that he has in common with the average of his fellows. But such common-sense knowledge is by no means sufficient when from one branch of thought an accurate co-ordinate practice has to ensue. A step in advance of common-sense has then to be made. Such is the case *par excellence* with medical knowledge. Were it not so, every element of that knowledge would have to be accompanied with a further explanation and life would be all philosophy and no science and no practice. In medicine, as, indeed, in all positive science, the inhibitory process, which is everywhere prone to operate on sense impressions, is itself further inhibited by a higher requirement of interest or duty on the part of the mind. Every sense impression which this interest or duty points to as important is allowed to have its full afferent discharge. Attention, which from one point of view may be described as the inhibition of inhibition, has the exercise of its full voluntary activity, discrimination of relations is exercised to the utmost, and generalisations formed are definite, and rounded off only by the impressions and relations which have been received from without and conceived to exist. If to a generalisation is added any contributory element of the mind other than that supplied from without, either past or present through association, the generalisation partakes of the character of unverifiable theory, and can have no place as real and positive medical knowledge.

From a survey of this distinctive quality of medical knowledge arises at once the reason why personal observation and experiment and practice are so necessary in medical education, and in proportion as the student can see for himself and think for himself and operate himself, so will he, consistently with his relative capacity, be the most successful medical man.

§ 11. On entering into a philosophical consideration of the remaining distinguishing features of the calling of the medical practitioner, viz., the *prevention of disease* and the *cure of disease*, the question may be asked, "What is the

first content which marks off a consideration of knowledge involved in these two conceptions from other knowledge?" A reply might be ready at once—"*A state or states of health.*" This would be the common-sense reply, but from the scientific standpoint, it does not carry very far. The standpoint of health is a common and familiar one, as well as the liability to departures from it, but when we consider the transition from bad health to good health, from illness to wellness, the notion of a state of health is seen to be a very relative and a very general one. It is the feeling of life plus the very important consideration as to whose life. Thus at the very outset of our philosophica analysis we are met by the great problem of individuality. If a patient is asked by the physician or surgeon as to his state of health, his answer, if given at all, is always referred to his own personality, such as, "*I* am very ill," or "very well," as the case may be. It will be readily allowed, however, that the very consciousness or notion of personal individuality may become an object for the physician or surgeon to consider as to the goodness or badness of health, more especially when the particular person in question has disordered feeling on the subject, or no feeling whatsoever.

Accordingly, the notion of the state of health for philosophical purposes must be set aside as inadequate for a fundamental distinguishing element in the knowledge of medicine, and the wider notion of *life* must take its place. Both the feeling of health, and the generalised conception of it, and the consciousness of individuality, are included in the notion of *life*.

§ 12. What is life? is the point, then, from which we start. The very utterance of the question suggests that we can conceive of something which is not life, and yet something as real, tangible, and as much an object of sense and thought as life itself. Even if we knew no more about the *not-life* than that it was a bare set-off or relation to *life*, should we dare to exclude that relation from philosophical consideration? But as we do know more about it than that it is a mere relation, and have reason to believe that what is *not life* is as important to the existence and maintenance of

life as life itself, two questions then confront us—What is *life ?* and What is the *not-life* in relation to *life ?*

All the facts which are included in the word life come under consideration in our analysis, also all the facts of the *not-life* which can be perceived to have any relationship to life. It is also from the standpoint of *life* the *not-life* is to be viewed, and not *life* from the standpoint of *not-life.*

But it is necessary carefully to note that we have not to do with the origin of life, except in so far as, if it can be discovered, it affords any explanation of the forms or processes of life. Nor have we anything to do with the cessation of life, except in so far as it affords any explanation of those forms and processes. We have, however, to do with the effects of life on the not-life, because they may afford explanation of the forms and processes of life, the whole realm of organic chemical effects for example ; and also, for a similar though much wider reason, we have to do with the effects of life upon life. Part of the effects of life upon life are perceived in consciousness alone, and knowledge as a part of consciousness has an effect upon life. Accordingly, the whole realm of consciousness and knowledge comes under analysis in a philosophy of medicine.

§ 13. In relation to life, a complete scientific theory, or generalisation of it, has never yet been made which includes all the elements indicated in the last paragraph. The reason of this must be that life, as including consciousness and knowledge, has never yet been conceived by the mind in its entirety. Yet common-sense and positive science from a certain standpoint both consider life as *one.* Consciousness declares itself as unity, and the objective thought that life is manifested in separate organisations, which, in the case of man at least, include nearly all the separate phenomena of all animal life, witnesses to the correctness of the conclusion that there must be a single law or principle underlying both consciousness or the subjective view of life, and organisation in unity, the objective view. The reasonableness of this conclusion has led scientific men, and medical men in particular, to spare no effort to discover this law or principle.

Many efforts have been made to generalise upon the

phenomena, or facts of life, but the arrival by consciousness at a perfectly satisfactory and definite conclusion has hitherto been inhibited by some other conclusion which had previously found a stronger hold of reason and judgment. Life, as including consciousness and knowledge, has hitherto been looked at from one of two opposing points of view. First, that it is something in itself, independent of that which does not constitute life. Although it appeared to have a certain relative dependence on the *not-life*, yet it has been assumed that this dependence was seeming, or appearance only, and that the reality of life was independent of its material conditions.

The opposite, or negative view, arose out of a critical analysis of the first-named view. It assumes that life is made up only of the phenomena of the not-life, and that the only final interpretation of it possible is by means of the laws and phenomena of the not-life. Present day positive knowledge places life somewhat between these two extremes. The negative critical element predominates, but it is not supreme. Students of medicine begin their studies with a knowledge of the facts of the not-life, on which life is said to depend; and, indeed, in theory they end here, for they are taught that the purpose of physiology is to refer all the phenomena of life to the natural laws of physics and chemistry. In fact, however, they do not end here, for writers and teachers on physiology postulate certain phenomena, which they term distinctively vital, and which do not admit of being all included in the phenomena and laws of physics and chemistry taken by themselves. The phenomena distinctively vital form the content of the whole division of science called biology, which includes physiology, embryology, psychology, and sociology. Biology, indeed, would have no *locus standi* as a science if all its facts and laws could be referred to the laws of physics and chemistry. This point need not be further pressed, however, for, as every one knows, there is a distinct morphology both of plants and animals, which cannot thus be explained without destroying it altogether.

As stated in the first sentence of this paragraph, life has never yet been viewed philosophically entirely as *one*, includ-

ing the objective phenomena, subjective consciousness and knowledge all combined.

§ 14. The question thus remains to be considered whether life can be viewed philosophically as *one*. It cannot be by the objective phenomena of life alone, because they do not include feeling, except as inference from reflective consciousness. It cannot be by consciousness observing itself alone, because there would be no proof of anything but the subjective consciousness of one individual. But can it be from an observation of knowledge as including both these elements? That is, can knowledge understand and explain itself, and the objects which form the content of knowledge; and can this explanation be stated in one theory, which shall commend itself objectively as positive science and subjectively as psychology in one and the same statement of real fact?

An answer to this question can be given in an assertion of affirmation; but the affirmation has philosophical validity only if the theory offered explains all the facts it professes to explain, namely, all the facts of biology, of psychology, and of philosophy. It may be added, too, that this has always been the final goal of all systems of philosophy, although they never yet have reached their aim. It is the purpose of these prolegomena to indicate whether any advance can be made upon the latest theories of life, which have been formulated by minds which have analysed the subject philosophically, and have been able to construct a theory thereupon.

§ 15. We have said that the real and complete theory of life must explain philosophy. This is equivalent to saying that further proof or explanation is unnecessary, the theory, therefore, must be self-evident; and as it is at the same time to be capable of explaining subjective consciousness, and objective knowledge, it must carry self-evident conclusions or proof with it into every fact of consciousness and objective knowledge.

§ 16. There are two current theories of life which have had much influence over the philosophy of the present day. An examination of each of these theories is necessary, in order that it may be seen how far they cover the ground

which is laid down by philosophy as necessary to the answer of the question, "What is life?"

§ 17. The first theory is that of Mr. Herbert Spencer; and is predominated by two fundamental ideas—change and evolution. Mr. Spencer says that life is "the definite combination of heterogeneous changes, both simultaneous and successive, in correspondence with external co-existences and sequences."[1] If a little thought is given to this statement it will be seen to be self-evident as far as it goes; that is to say, that life is made up of change; but if we ask how those changes are made into definite combination, how they can be said to occur together, or successively; what is internal and external, and what correspondence is there between them; and what are external co-existences and sequences; all these things are not self-explanatory or self-evident; they postulate something further. Mr. Spencer says this something further is merely the process of change —evolution. But although evolution may be objectively evident when observed externally it certainly is not self-explanatory; it needs a further explanation. Of this explanation Mr. Spencer himself feels the need; for he postulates two other things in addition to both change and evolution, of which he offers no explanation. In order to account for certain peculiarities of form assumed by life, Mr. Spencer introduces the term *organic polarity*. The word polarity is adopted from the tendency which certain bodies in the external world have to assume a form peculiarly their own, and Mr. Spencer uses it in reference to what he terms the physiological unit, an aggregation of which give unity and form to organised beings. He terms the sum of the force of this aggregation, the sum of organic polarity.[2] But this is only putting the question of life further off, for we have no explanation of what the physiological unit is, nor any suggestion as to the meaning of the term, "organisation." The other element Mr. Spencer introduces into his philosophy, is what he terms a "unit of conscious-

[1] "Principles of Biology." London: Williams and Norgate.

[2] "Principles of Biology," vol. i., chap. iv., p. 181.

ness," and he assumes that consciousness in the mass is an aggregation of these units. The same remark applies to this assumption as to the former one, it shifts the ground further off, without being an explanation of the existence, either of unity, or of consciousness.

§ 18. *The protoplasmic theory of life* is of quite a different order from that of Mr. Spencer. It aims at no comprehensive view of life in the abstract but endeavours to arrive at its beginning, and conclude the nature of its essence from that beginning. If I were to characterise it shortly, I might say it is the result of a diagnosis by exclusion. The mind is driven up to the primitive substance of the organism, and its most elementary movement, and the substance itself is recognised as life, and its movements, phenomena belonging to it.

The result is very important, for not only is the substance protoplasm discovered to be the ultimate known basis of the life of all organisation, but that itself lives absolutely without organisation, and all organisation is the result of the action of the life-substance, and cannot be maintained apart from it.

The physical characters of this substance are as follows: "It is a clear, transparent, structureless, colourless, semi-fluid, viscid substance, which possesses weight; its chemical constitution is unknown; in contact with other substances it possesses the power of spontaneous movement, or of acting against its own gravity."

This theory was the result of scientific observation of life in its simplest forms, and it has found expression in the work of the late Dr. John Drysdale.[1]

Drysdale's book was written in 1874. As a matter of course, researches have been going on ever since; but the theory in its essential features maintains its ground.

As a summing up of the latest researches I may make the following quotation from Quain's "Anatomy," ed. 1893: "Until comparatively recent years it was universally held

[1] Dr. Drysdale was himself an original observer in the field of the microscope, and at the same time an honoured member of the Homœopathic Society.

that the principal or living substance of the cell to which the name *protoplasm* is applied is a completely homogeneous material . . . entirely devoid of structure. It is possible that this view may hold good for some cells both animal and vegetable, especially in those which are 'fixed' or non-amœboid. It is found that a differentiation of the protoplasm has occurred in such a manner that a part of it appears under high powers of the microscope in the form of a net-work or sponge-work, whilst the rest of the protoplasm occupies the meshes of this net-work." Be this as it may, both the *spongioplasm* and *hyaloplasm*, as these varieties are termed, are both *protoplasm*.

It has also been noted that the younger the cell the greater is the relative amount of hyaloplasm ; it is, therefore, probably safe for the present to infer that the structureless variety is the more primitive.

The relation of the protoplasmic theory to the structure of the cell may be stated as follows :—The cell wall, if present, and whatever structural element there may be within, or helping to constitute the nucleus, such, for example, as the chromatic filaments, are the result of the vital activity of the protoplasm, which vital activity is considered to be more active in the region of the nucleus than in the outer part of the cell. Under the dominion of the protoplasmic theory, all parts of the body which do not consist entirely of this substance are considered to be dead ; that alone is alive ; that alone is the animating substance of the completely developed individual. Thus (following Drysdale) within the body we have—

So-called living matter.—White blood corpuscles ; protoplasm of epithelial cells; bioplasts of different tissues, varying in number according to the different tissues ; nucleus of the cells of grey matter of brain and spinal cord and ganglia; nuclei of nerve fibres.

So-called non-living matter.—Cell wall ; threads and filaments and vacuoles between cells ; fibrous, connective, bony, elastic, or other tissues ; radiating fibres of caudate nerve cells and outer coats of the cells ; nerve fibres in general ; hard parts of epithelial cells ; all liquid secretions

and liquid parts of blood, lymph, chyle; cilia; cuticle, hair, nails, horn.

Drysdale's summing-up of this theory and conclusions drawn from observations on the phenomena of protoplasm may be stated as follows:—"Life is, therefore, not an entity nor a force, but an action—that action alone which is involved in the consumption and regeneration, from pabulum, of a material compound entirely *sui generis*, under certain conditions or stimuli."

The main value of this theory lies in the fact that it brings before the mind two elements that are characteristic of all life, all consciousness, and all knowledge. Neither knowledge nor consciousness nor life are known to exist without them.

These elements are known as matter and movement. Whatever validity or significance may eventually be attached to those terms, they are at present elemental in their meaning, and may be accepted as the groundwork of a satisfactory explanatory theory of life. But the theory affords another element characteristic of all life, consciousness and knowledge. Protoplasm is said to possess the power of acting against gravity, and although this power is never exercised except under the influence of a power from without, yet it is not a mere result of that power, for according to known physical laws, the energy resulting from potential energy is kinetic energy, whereas when potential energy acts upon protoplasm in degree relative to its mass, the result is not kinetic but potential.

In other words, there is a reaction *sui generis* of the protoplasm, in addition to bare reaction of the mass. Only in this sense can a mass be said to act against gravity. If this activity is imagined in consciousness and knowledge, its truth will become self-evident as a fact of consciousness and of knowledge itself.

In these three points, then, that life consists of both matter and movement, and, dependent on matter and movement, acting upon itself, has a movement of its own, the value of this theory ends. It gives no account of the effects of the movement of life which are peculiar to itself,

except to infer that organisation is the result of it. No account is taken of the fact that organisation is made to serve the purpose of this movement, or that this movement is intensified by means of organisation. A further statement concerning this movement is necessary; it requires a further generalisation of the mind—a law to explain it.

§ 19. A final question must be considered, and it resolves itself into a test of the validity of the knowledge which is derived from an observation of itself. The validity must be tested by the results of the inference when arrived at. If it is self-evident, and explanatory of all objective knowledge of life, and of consciousness itself, it will be valid for the purpose for which it is made. With regard to an ultimate test of validity for all knowledge, we accept Mr. Spencer's criterion. The inference must submit to the furthest critical analysis it is susceptible of, and then the contrary must be discovered to be unthinkable.

CHAPTER III.

A Bio-Dynamic Law.

§ 1. The requirements of an adequate bio-dynamic law may now be briefly stated as inferences from the foregoing statements :—(*a*) The statement of the law must set forth the relationship which obtains between life and the not-life. In other words, the facts and laws of physics and chemistry must have their place assigned as causes of the facts of life ; (*b*) The statement of the law must consist in a generalisation which shall include all the facts of life itself, and distinctive of all forms of its matter and movement ; and (*c*) On account of the known fact of life having a matter and movement *sui generis*, the statement of the law must indicate the causative or dependent relationship of this movement to the physical and chemical facts and laws of itself.

§ 2. One of the most obvious facts of conscious thought is that it may be either resting or active. Such a statement applies to consciousness itself, as witnessed by the difference between sleeping and waking, or when we say a person is unconscious. It also applies to the process of thinking in relation to consciousness. Another point in relation to both rest and activity is also obvious—namely, that both the rest and activity of consciousness and thinking alternate with each other throughout the whole of the range of consciousness and knowledge, and that the one is in relation of causative dependence upon the other. Consciousness could not continue without rest either as a contained phenomenon of the organism, or as an element of activity. And the same statement applies to thinking in relation to consciousness.

Another very obvious fact is that granting the successive cessations of activity in rest, the activity of the process of thinking increases itself by exercise, or thinking increases by

spending itself. Consciousness also increases itself by spending itself in the thought of itself, not in the sense of extension, however, for consciousness is thus bounded by the extended object in which it rests, but in the sense of intension or intensity. When it is said that thought widens, it is not meant that it extends, but that it intends—that is, every increase of thought becomes potential for further increase. The same applies when it is said thought deepens when it comes to think more and more upon itself.

§ 3. These are obvious elements in the process of knowledge, and if an attempt is made to believe their contrary, it will be found impossible. It is proposed, then, that these elements shall be gathered into a formal statement, and applied to what is known of life in protoplasm and organisation. It will then be seen if they afford any further explanation of protoplasm and organisation than has already been given. One word, however, as to the meaning of the term *rest*. It is relative rest that is to be understood. For instance, thought rests in personal consciousness; consciousness rests in the organism which contains it; the organism rests by gravity on the earth; the activity of the organism rests in its own gravity resting in the gravity of the earth. Thus the law of gravity is an absolutely essential condition to a knowledge of life and to the existence of life. It may be most fittingly termed the physical basis of life, and the law of gravity is part of the law of life.

§ 4. The theory of life may accordingly be stated as follows:—

In absolute dependence on the phenomena and laws of physics and chemistry, life is a mode of energy, sui generis, *occurring simultaneously in the resting and active conditions. The law of its resting condition is the purpose of the active. The law of the active condition is that it increases itself by spending itself.*

§ 5. Before proceeding to give illustrations of the theory, it will be necessary to make some general observations explanatory of the phraseology used in the statement.

(*a*) No further attempt is made to explain the relation-

ship of the laws of physics and chemistry to the universe at large or their special causative relationship to life. Their special causative relationship to life is not yet known, except the fact of an *absolute dependence* on their *constancy* and *operation*. Their relationship to the universe at large is outside the immediate scope of a philosophy of medicine.

(*b*) *On the use of the word Energy.*—This word is used advisedly because of its ultimate conceptual character. Potential energy must be understood, and it must be carefully distinguished from the isolated conception of force. Force may be the result of potential energy, but it cannot exist without matter, whereas potential energy or power is behind both matter and force. Life is thus a mode of energy—that is, it exists as matter and displays force in certain ways or modes, but it is not a force distinct and by itself. To term it so is recognised at the present day as a mere convenience of phrase which may belong to common-sense but not to positive science.

(*c*) The statement of this theory will be discovered to be self-contradictory if, as far as the objective phenomena of life are concerned, any attempt be made to imagine it in its entirety in the mind. Why so? Because in whatever state of life these phenomena are observed, only a part of the process is seen to be in operation at once. The total process includes the opposite or contrasted and inter-dependent part, which may come under observation the next minute, and be perceived to be a part of the whole by an effort of the mind. Take a simple example :—The phenomenon of the action of the biceps muscle is observed and known to be the result of the contraction of the fibres of that muscle, which again results from an impulse received from its related nerve. But if we turn from watching the action of the muscle, say in lifting a weight, to examine the muscle itself or its nerve, or the connection between the two, the action of the muscle for the time being drops out of mind, although there is an association by the mind of the one being dependent on the other. They are both referred to a vital process, although this vital process cannot be witnessed in its entirety at once.

(*d*) *The bio-dynamic law* illustrates what I have been noting in its most extreme form. It will be recollected that an element in the protoplasmic theory was that protoplasm could act against gravity. If an effort is made to conceive this, it is impossible, yet there is no doubt that if a man or an animal tumbles down, and has conscious intelligence or vitality enough, he will get up again and assume a position of equilibrium, that is, he will set his vitality against his gravity, depending, of course, on the gravity of the earth. But the bio-dynamic law means more than this, and something which makes it more difficult still to image in the mind. Not only does vitality act against gravity, but, depending on it, it increases itself by spending itself. This is the central fact of life. What is lacking in previous explanations of life receives interpretation from this fact observed in the relations on which it depends.

§ 6. The statement of the law is now given ; and, of course, its value depends on its applicability to the phenomena of life as they are known in the sciences included under the class biological.

The theory here given may be stated shortly again in the sentence, that it is the protoplasmic theory plus the fact that life increases itself by its own activity. It will now be necessary to illustrate its explanatory value by a reference to facts relating to the movement of protoplasm itself, to the physiology of the cell, embryology, general physiology, and psychology.

§ 7. *The Movement of Protoplasm.*—In considering the phenomena of the movement of protoplasm, it is necessary to assume that these phenomena will not be exhibited at all except under the stimulus of energy from without. But note this :—That wherever protoplasm exists at all there always is energy without, which in popular language is called the environment. The protoplasm is dependent on *some* influence from its environment as an incentive to the manifestation of any of its activity. There are the simple mechanical action of currents of air, different degrees of heat and electrical tension, and a relative intensity of light. Other gases besides those included in air exert an effect

upon it, as well as liquids and solids of the greatest variety and difference of density. The wonder is, that considering the physical qualities of protoplasm it does not on the slightest stimulus become dissolved; but wonder ceases if we recognise a law for itself in addition to the laws of the environment. Protoplasm reacts upon the varying stimuli which are operating upon it. Can we doubt the significance of the "amœboid" movements, that they are a direct response to different movements in relation to it? In these amœboid movements we have an expenditure of force, a reaction against other force. But what is the result? A dissipation of the particular substance which is the potential source of it? Not at all, but the very reverse. In the course of these movements, oxygen is being absorbed, heat is generated, some particles of other substances are caught and invaginated into the protoplasmic substance, movement is possible, some so-called organic material excreted; all being, in common language, a dissipation of energy. But does the protoplasm body dissipate? Not at all, but the reverse. It gets larger, its activity intensifies. Now allow a sufficiently strong mechanical stimulus to divide the protoplasm gently into two. What is the result? A dissipation of the energy of the whole? Not at all, but the reverse. Each division in itself becomes a centre, a focus for a reaction against the environment equal to the original reaction of the parent multiplied by two.

I am arguing for an absolutely self-contained reaction of the protoplasm on the environment; but, as a matter of *fact*, that is never *observed* to take place. What is seen is only part, which is the result of the operation of a law of the whole. Part is at rest and part in movement: *at least so it appears;* and the resting part is a basis for the acting part, as witness the support which the main part of a corpuscle must give to the pseudopodium as it is projected out from the body in response to a stimulus. This latter point will be illustrated better when we consider the subject of organisation.

§ 8. *The Physiology of the Cell.*—The cell is the first step in the process of organisation. The cell wall and re-

ticulum, when present, serves a double purpose. If any portion of protoplasm can display degrees of energy in its reaction on the environment, and can, by means of energy received from without, convert itself nto a substance of greater density than itself and of different relative density to substances which constitute the environment, this substance will become a substance on which the protoplasm may depend, and against which it may react. This is an obvious truth, but it is the root-fact of all organisation. In the formation of the cell wall or reticulum, even though it may result from some special influence of the environment, and death of some protoplasm substance, as long as it remains round or in contact with the cell, and is renewed by its activity, it becomes a means to the increase of its vitality. The formation of such a structure is an illustration of the law that life increases itself by spending itself.

A careful note must be made of the fact, that the cell wall or reticulum, or spongioplasm as it is termed, possesses in its inherent quality the merest shade of difference from the original protoplasm. Too much importance cannot be laid on this difference. Its significance is more than can be sufficiently emphasised. In that shade of difference may be perceived not only the beginning of organisation, but also the foundation of all pathological conditions, and likewise the possibility of scientific therapeutics. As structure becomes more differentiated in form, and life more intensified; as the body of formed material and protoplasm becomes more and more an organised unity, the finer differences disappear from view, but their significance remains.

In the phenomena of karyokinesis[1] or reproduction of the cell by means of changes which take place within the nucleus, the significance of this difference may be more fully illustrated. An acquaintance with the phenomena of karyokinesis is assumed; it would take too much space to describe the process in full detail. The first point to which attention should be given is that the process starts when the nucleus is in a state of *rest*. Rest is the basis or condition of the

[1] Quain's "Anatomy," vol. i., part ii.; Waldeyer, *Quarterly Journal Micros. Science*, vol. xxx., 1889.

activity of life. The contents of the nucleus, the chromoplasmic network (so termed, because of its highly refractive character) consists of material formed out of the protoplasm of the nucleus or cell; this becomes converted into a closely constricted skein of filaments—shall we say as a result of the protoplasm entering into a highly complicated chemical union with substances which have been absorbed from without? By a star-like arrangement the skein becomes gradually divided, not, however, without the intervention of a structure more proximate to the protoplasm. This consists of a thread-work in the shape of a spindle consisting of achromatic fibres, which finds its way to the polar area of the nucleus and seems to have an important function in assisting the disposition of the chromatic skein, which eventually results in the division of the nucleus and thereby of the reproduction of the cell. Our bio-dynamic law here suggests that the cell generates the achromatic spindle, and the network of chromatic fibres, by union with some substances in its environment, and then depends upon the presence of this formed material to effect its own division and consequent reproduction. That is, the progressively non-vital achromatic and chromatic filaments effect the division in the nucleus, but the separated protoplasm lives on and increases by its inherent vitality.

§ 9. *Embryology.*—In a consideration of the subject of embryology in the light of our proposed theory of life, it is necessary to allude first to the structure and contents of the ovum in their relations to each other. Taking them in order, as the ovum leaves the Graafian follicle, there is the investing membrane, the zona pellucida, the mass of protoplasm, a number of small, highly-refracting granules, and globules of various sizes, and, lastly, the germinal vesicle. The latter is, perhaps, undergoing the process of karyokinesis, the result being the polar globules, which are extruded, leaving the female pronucleus which becomes the subject of fertilisation by the male pronucleus.

Has the zona pellucida any function? Looked at physically, its occurrence is a mere accident, but vitally, it cannot be so regarded. Consisting of formed material, contributed

by the maternal protoplasm, it forms a protective covering for the ovum. But its function is much more important than this. It also forms a preliminary mechanical environment for the protoplasm of the ovum, acting as a stimulus to the activity of the cells after fertilisation and segmentation has taken place, and potent in the production of the outer layer of the blastodermic vesicle. What has been said as to the function of the cell wall applies, under the altered conditions, to the zona pellucida until it disappears, after the formation of the blastodermic vesicle.

The variety and composition of the granules and globules within the yolk cannot fail to have important physical relationship to the cells of the protoplasm, as they become more and more divided.

Primarily these substances afford nourishment to the protoplasm, but they must have a distributing influence upon the cells as well, if the intimate movement of the cells is capable of being influenced by surrounding conditions. It is not very hazardous to say that varieties in the individuality of different offspring might arise from the influence of varieties in the contents of the ovum at the time of fertilisation. It would be difficult to say where this influence begins or how far it may be extended into subsequent organisation, but the movement of the protoplasm, in its reaction upon this limited environment, is always in the mode of self-increase by self-expenditure.

Before referring to the process of fertilisation, the significance of sex must be alluded to. The most elementary fact of sex is the possibility of fusion of masses of protoplasm, and a continuation thereby of its normal movement. No advantage results from simple fusion, however, until some difference exists in the relative intensity of the normal movement of the different masses, and in viewing sex, philosophically, it may be said to be the extreme advantage of the effect of difference taken by life. The difference would generally consist in intensity of energy or movement, combining in reaction on external stimuli, the result being more highly differentiated organisation. But while sex is the extreme advantage of difference taken by life, it is also the

most evenly balanced effect of life upon life. There are homologous parts contributed by both sexes to the reproduction of the new offspring. The male pronucleus has little difference in appearance of structure from the female pronucleus, but the organisation of the spermatozöon is as different as possible from the protoplasm mass of the yolk. These are homologous, but they are relatively almost opposite modes of energy, the one representing the active and the other the passive conditions of energy, but both are subservient to the reproduction, development, and increase of life.

How far these principles are applicable to the likeness and difference of sex will be readily seen; one statement only is sufficient to indicate sex as the most conspicuous illustration of the theory of life here given. What is common to both sexes is the uniform mode of movement of life, it increases itself by spending itself. What is distinctive of either (in relative degrees, of course) is the resting or active conditions, and the one is for the purpose of the other, which is common to both—the increase of life. A recognition of these principles will afford an explanation of all problems of the effects of sex, and will be a key to the process of natural or sexual selection, always remembering that the principles are relative in their operation as regards the distinctive, but absolute as regards their essential qualities. And a self-evident inference may be added in the statement that the most highly developed offspring will result when the essential qualities of the sexes are exhibited with the greatest intensity, combined with the most refined and delicate adjustment of their distinctive qualities.

The most conspicuous effect wrought by the process of fertilisation is the determining character which is given to the nucleus formed out of the conjugation of the male and female pronuclei. In the most highly-developed form of life, the determination wrought by the nucleus results in the transmission to the offspring of the most exquisite differences in structure and function found in the parents, and which mark them off from each other as individuals, also with some new qualities produced peculiar to the new offspring, so that

a new individuality is the result. The offspring is also marked off by differences which occur in the same family as distinct from other families, as well as by more marked differences in the same race, species, genus, class, or division of the animal kingdom. The one central fact common to all likeness in difference here exhibited, is the intense expenditure of intense energy by the original nucleus, in order that the same energy may be reproduced, and still further intensified.

With truth it may be said that energy, acting from without, is infinite in the variety of promptings to protoplasm to exert its peculiar mode of activity; and that such energy was operating before and has been operating ever since the conditions were fulfilled necessary to the appearance of life upon the globe. Grant then, that protoplasm has been exerting its own peculiar mode of activity—that of increase of itself by spending itself—with dependence on gravity and difference of stimuli, have we not an intelligible explanation presented to the mind of the factors which have worked out the almost infinite variety of form which organisms have assumed on the face of the globe?

In the segmentation of the protoplasm of the yolk which has been determined by the fertilised nucleus, combined with the distributing physical qualities of the refracting granules and globules, we have the factors necessary to the formation of the blastodermic vesicle and its further separation into the layers epiblastic, hypoblastic, and mesoblastic.

The next process is that of specialisation in the character of some of the newly-formed cells, which are the basis of the first essentially organised tissue to receive indications of differentiation—the nervous tissue. This specialisation consists in one layer possessing the darkest cells with the largest nuclei—the epiblast. In these cells there is a concentration of the energy of the protoplasm which through generations has resulted from a variety of pressure or stimulus from the environment, but in each individual is determined by the intensity of energy in the protoplasm of the ovum, combined with, and more finely determined by, the nuclear elements of the germinal vesicles, both male and female. In propor-

tion as the energy of the protoplasm thus becomes differentiated and concentrated, so, in proportion, according to the inevitable result of the operation of the law of life, does it assume a controlling and determining energy in relation to all other protoplasm and formed material within the organism. The stages of development of the different structures of the embryo in which the young life takes on an activity in relation to its own organism, constitute the real dividing line between embryology and general physiology. For the purposes of illustration, further references to the processes of development will be made under the head of general physiology.

§ 10. *General Physiology.*—As structure becomes more developed and more complex, the protoplasm in intimate association with it, on account of the extra resistance of structure, loses its energy in proportion. But the very occurrence of structure or formed material, has been a stimulus to other cells to a more intense activity, and as these latter depend or rest on the other structures formed, which are still animated by their own protoplasm, though but feebly, the higher experience a concentration of their energy. On account of this, in accordance with the law of life, these concentrated cells assume more and more a controlling, determining power over other parts. Such a statement in a few words may be called the theory of the nervous system, and in the animal kingdom, as is well known, a germ of a nervous system appears as soon as there is a collection of cells united by structure to form a single organism, for example, in the Cœlenterata. Little or no difference can be noted in the appearance of the protoplasm of the nerve cells from that of ordinary cells, except that the nucleus is larger and perhaps darker than usual. But there is the widest difference in the functional activity of these cells from those of other tissues of the body, for example, those of the epithelium of different serous and mucous cavities, the gland cells, &c., &c., and also between different cells of different parts of the nervous system. The process of differentiation and consequent control is carried so far that even the structure which supports the nerve cells is supplied with

nerves in the shape of the nervi nervorum. We must not assume, however, that the cells of other organs, or the bioplasts of the formed material, have no independent activity of their own; if they had not, they would cease to be protoplasm. They have an activity of their own and an essential one, only, if left without the guidance of nerve impulse, they would be over-shadowed by the structures to which they are related, and would so act out of harmony with cells of other organs with which they are intimately connected. I may cite two disorders familiarly illustrative of this—the production of glycosuria as a result of injury to the floor of the fourth ventricle, and functional albuminuria on account of some emotional nervous disturbance.

A modification of nerve cells is exhibited in the nerve fibres. The axis cylinder is developed out of rudimentary ganglia cells, each cell being bi-polar and stretching out its projections to join with other cells, and so constitute a vital or protoplasmic connection through the centres with every part of the body. Thus, what is termed conduction of impression or impulse is as much a vital process as sensation or movement. That the sensory nerves are seen to begin their process of development before the motor, is a fact in keeping with increase of life generally, and with the dynamic law which waits for a stimulus from without for the excitement of its activity.

Another important point is in relation to the connection of the afferent nerves with the nerve centres.[1] "Having entered the nerve centre, the bundle of fibres divides into two branches which appear to break up into fine ramifications without being continuous with the grey substance." We may gather from this that sensation is a separate and distinct function of life, and is not necessarily connected with movement. The stimulus from without finds the sensory nerve, both organ and fibres, at rest, it awakens their activity, the sensation remains with the end organ or is conveyed to the centre, and the stimulus ceases, the end organ and nerve return to rest; but the centre may have been awakened to activity, that activity may be manifested

[1] Quain's "Anatomy," vol. i., part ii., p. 328.

in discrimination of the sensation, and, associated with others, it may be received and a flush of pleasurable sensation pass over the whole body. But if the sensation be of a different order, other nerve activity may be excited, that which impels a single movement or co-ordinates a number of movements in certain muscles. As soon as the sensation is discriminated the sensory centre returns to rest; as soon as the movement is accomplished, the motor or co-ordinating centre and nerve return to rest. What is the significance of all this? Simply that sensation, discrimination, motor impulse, co-ordination and the resulting muscular movement are all separate functions, and have as their one common associated law the increase or interest of the life of the organism, and that they intimately and separately work from the resting state to the active state, and from the active to the resting, the one being for the purpose of the other, and in so far as rest and activity are properties of one set of structure and function, so do they combined contribute to the activity and rest of the whole organism. Let it also be noted that as sensation and movement are separate functions, they are transitions to and from a more or less full intensity of life. Especially if they are pleasurable, they are transitions to and from a *more* intense life. If they are painful they are transitions from a greater degree of intensity of life to a less.

Neither pleasure nor pain as sensation could result if there were no special law of life. The one results from increase in itself, and the sensation of pleasure is part of the increase, the other results from decrease of itself and is part of the decrease. And so pleasure and pain themselves become confirmatory of the law of life.

Some mention should be here made that symmetry of form and combination of form in symmetrical or multiplied organs can be explained by the operation of the bio-dynamic law in the face of gravity, and influence from the environment, but the proof followed out in detail would occupy too much space for the present address.

Having considered the nervous system in relation to the body generally as possessing the controlling function over all

parts of the organism, detailed reference to the separate functions is unnecessary except to indicate their relative importance as contributory to the vitality of the whole. Foremost and most general of these functions is the regeneration of formed material through the circulation of the blood and by means of the subsidiary functions which maintain the blood in its required condition. Mention might be made of the action of the heart, the combination of its innervation, muscular movement, own blood supply, and rythmical action and reaction to the stimuli wrought by blood pressure as well as blood condition. This complicated mechanism is sustained in its operation by a relative intensity of life in the balance of its innervation and motor function, both being related to the exercise and self-increase of the whole organism.

The same may be said, although in altered relation, of respiration, digestion, absorption, assimilation, secretion (internal and external), and excretion. They all exhibit, to some extent, in their individual operation, the law of self-increase by exercise, but only in relation to the balanced operation of each other, and the integrity of the nervous system which controls them.

Reproduction is so much a manifestation of the law of life in itself, that although the mechanism of it is relegated to certain organs, these cannot act of themselves without the co-operation of all nerve centres, which have a controlling function over the whole organism, and unless any centres which have a higher function than that of reproduction, such as the reflective consciousness in man, are themselves at rest.

All the organs and functions of the body find their unity through the nervous system by means of its operation upon the gravity of the mass. It must, however, be remembered that the nervous system could not exist, and, indeed, could be of no use apart from the whole body, or the integrity of all the parts, and that the function, or purpose, of the whole is that of self-increase, which is accomplished by the expenditure of force on the part of the whole in the balanced operation and alternation of activity and rest.

§ 11. *Psychology.*—(i.) In his "Protoplasmic Theory of Life,"[1] Drysdale refers to consciousness as an incidental phenomenon in relation to protoplasm, and that it is not a link in the chain of material transformations, which are accounted for by other causes and results. "Consciousness (it is said) thus belongs to the properties, not the forces, of matter, if to matter at all, and is equally out of the province of *à priori* investigation with the qualities of the ether, and the atoms, which must be postulated as the necessary foundations of all scientific inquiry." Such a begging of the question is eminently unsatisfactory; it arises from accepting as a complete theory of life what is only a basis for a theory.

(ii.) Consciousness is the basis of psychological inquiry, and the link which joins psychology to physiology is the conception we have arrived at in the last paragraph—the organic unity of the nervous system. All parts of the nervous system are capable of acting in relation with all other parts. This is an obvious truth from experience and physiological knowledge. But it implies a great deal more than the mere conception of the reception and conduction of sensory impressions, the discrimination of them, the co-ordination of impulses to movement, and the impulses to movement themselves. If all these elements are to act in relation to each other from any part of the body, or in relation to a possible activity of the whole, there is implied a much greater intensity of activity in the centres of the nervous system than in any of its parts, and if one of these elements can act in relation to the whole, there must be a centre for that whole, which must exhibit the greatest degree of intensity of activity of any part of the nervous system. The arrival at such an actual synthesis of all nervous structure and activity may be taken as the organic basis of consciousness.

(iii.) We should like to localise this synthesis in the brain, but as this can only be done theoretically its value is psychological only. Some elements in such a synthesis may, however, be pointed out.

It would include in the lowest animals possessing a de-

[1] "Protoplasmic Theory of Life," pp. 233-235.

veloped nervous system, a massive connection and contribution from the spinal cord, both from the posterior and anterior columns, and their commissural fibres in both cord and brain, less massive connections from the centres in the medulla oblongata, these again being associated in some degree with the spinal cord. A most massive connection and contribution from the cerebellum would be included, as well as the great cerebral ganglia and their connections. The association of all these with the optic and olfactory tracts and the auditory and gustatory centres would make up the group. The cerebral cortex, for this purpose, may be regarded as an after product.

It is impossible to go into detail as to the multiplication of effects both in structure and function, in sensation and movement, in brain states and consciousness, which such a synthesis involves; they form the whole content of brain physiology. A few features may be noted illustrative of the operation of the law of life.

(iv.) What is involved in our conception of the organic unity of the nervous system plus the beginning of consciousness? Let there be carried in the mind the separate functions in the massiveness in which their operation is experienced, and let it be remembered that if one is called into play, there is a certain activity implied of that one, and then rest of that one results. But because a nerve centre is resting, is there no life in it, or is the dynamic law not in operation? Does it not simply wait in a condition of unstable equilibrium, until a fresh stimulus, either from without or within, rouses it into activity again? Apply this principle all round. Suppose there is no activity of any part of the brain going on, the animal is asleep, in a resting state, a relatively passive condition of unstable equilibrium of the whole central nervous system, which may be roused in some part to activity as soon as a sufficient stimulus be applied.

Let that stimulus be applied to some part of the body sufficient to rouse the whole. Bare consciousness is the first experience, plus the sensation of the stimulus, the emerging of an overtone of the organic unity of the nervous system,

containing a contribution from all parts, as suggested in the previous paragraph. The inference is that consciousness begins in the experience of an individual, as soon as that unity is organised in the brain, and afterwards it always emerges as a result of that organised unity being in a resting state.

It will have been implied that the conception of the unity of the nervous system involves the conception of a relative degree of intensity of energy, an intensity which not only allows of each part acting in response to a stimulus but what is common to all, being roused at the same time. This common element is the energy to increase itself by exercise.

(v.) The scheme involved in this conception may be set out in detail as follows: Sensation is increased by the exercise of itself, and it is associated with discrimination and co-ordination and with movement.

Discrimination is increased by the exercise of itself, and it is associated with sensation, with co-ordination and with movement.

Co-ordination is increased by the exercise of itself, and it is associated with sensation, discrimination and the impulse to movement.

The impulse to movement is increased by exercise, and is in association with co-ordination and discrimination and sensation. Now, if this is so, it is not possible for all these processes to be aroused in part, without in some sense the whole to be aroused. But in their mechanical effects, two of them, co-ordination and movement, act against the other two, discrimination and sensation. The physical force between them must therefore be neutralised, but what remains is its combined intensity, *which, as a whole,* manifests itself as consciousness.

If the bio-dynamic law here given is true, in consciousness it will be observed to be acting as a whole and not in part. Is this so?

(vi.) In what does the consciousness of self consist? It may be replied, in an intensification of bare consciousness brought about by the law of increase by exercise, operating

through bare consciousness in relation to one part of the brain and in connection with another.

Examine the consciousness of self and see if anything more can be found in it than the uninterrupted and continued operation of the law of increase by exercise, always provided however, that periods of relative rest are understood, for both whole and part, these again being preliminary and preparatory to a further increase of the whole or part by exercise.

A stimulus can be applied to one part of the body only while every other part is at rest. Or, an incitement to movement from sensation without or within may occur within any part of the central nervous system while every other part is at rest. What is the significance of these facts in relation to consciousness? They are the primary fundamental elements of thought, a feeling of difference, a relation, the first stage of stimulus to the thought of self as distinct from *parts* of the conscious self.

In this elementary feeling of difference there are two qualities. These qualities we saw in effect to exist in the most elementary stages of life, only in consciousness they arise as part of self-feeling. The first quality is the feeling of reaction of the body to the external stimulus. The second is the feeling of rest which results from it, the feeling of rest resulting from the stimulus to reaction of the body against its own gravity.

The whole knowledge of the external world, the whole process of thought, the differentiation by thought of sense-impressions, associated with self and the thought of self, into perceptions, perceptions into conceptions, feeling, and the perception of relations between things and thoughts, and between things and thoughts and self, are one and all built up by the original feeling of difference in response to the stimulus from without, and the reaction of the dynamic law; always remembering the relative capacity of this reaction to rest, that the reaction is always in the nature of increase by exercise, and that the increase takes place in consciousness intensively and not extensively. If this is so, the law affords an explanation of the increase by experience and knowledge, not by mere mechanical exercise of the

body, but by an increase in the power to perceive shades of difference in proportion to the intensive activity of the nervous system and thought.

(vii.) A few words must here be said on the subject of attention. The fundamental element in attention is the co-ordination of the activity of consciousness upon some element or elements which arise in thought; these elements consisting of sensations, perceptions, conceptions and the relations between them, or the relations from them abstracted by thought into a relation to itself. Attention may be involuntary or voluntary. An "arrest of attention" may arise from some stimulus from without or within the organism; the concentrated reaction of the mind arising from an interest in the effect of that stimulus affecting the whole.

This interest partakes either of pleasure or of pain, either of the increase or decrease of life. "Voluntary attention" consists of an intensification of the simply arrested attention, where all the energy of the mind is concentrated upon the stimulus to thought in consciousness.

(viii.) A reference to the known laws of association must conclude our illustrations under the head of psychology. Here I draw largely from the most modern work on physiological psychology, that of Professor William James, of Harvard University.[1]

Professor James attributes association primarily to the mechanical arrangement of the brain structure. Under the influence of what law this has been developed, has been suggested in previous paragraphs.

But we cannot consider that the mere mechanical arrangement of the brain structure is sufficient to account for association. The whole multitude of sensations, percepts, concepts, and their relations depend, no doubt, upon the organic activity of the nervous tissue; but it is to be doubted that by the laws of nervous action, as hitherto formulated, these can be summoned before the mind in a certain order, some of them selected, and some of them rejected—a new thought compounded by the process, and this thought

[1] "Principles of Psychology," Macmillan and Co., 1891, vol. i.

perceived and conceived in relation to all the others, to personal consciousness, and to all the new sensations of the external world.

The most elemental conception of association is the occurrence of two thoughts of objects, together with something as a common bond between them, namely, consciousness understood. But the thought which binds the two thoughts together and makes a new one of them, is by no means a mere conductor of sensation or impulse to movement, as might be supposed to take place through a nerve fibre.

This so-called combining thought is itself an activity, a synthesis, or what appears as a new thought never could arise. And what I contend for is that this very process of association itself is an illustration of the operation of our dynamic law. The essential element in it is that thought is increasing itself while it is spending itself; and that both the first object or relation thought of and all the elements it is associated with are part of the activity of personal consciousness which in its turn is brain activity.

Let this essential element of association be kept in mind while the laws of association are considered alongside of it, and they will be observed not only to corroborate the view here given, but to be themselves illustrations of the same fundamental law. Take the law of contiguity, for example.[1] "Objects once experienced together tend to become associated in the imagination, so that when any one of them is thought of, the others are likely to be thought of also in the same order of sequence or co-existence as before."

What have we at the foundation of the following conceptions: "Objects occurring together," "associated in the imagination," "likely to be thought of," "same order," "sequence," "co-existence," "before"? Every thought in this sentence implies the operation of the law here given in its entirety, and observed in different degrees of operation, with different resting states.

In the ordinary process of association the law does not have free play to act of itself. "In no revival of past

[1] "Principles of Psychology," W. James, vol. i., p. 561.

experience are all the items of thought equally operative in determining what the next thought shall be; some ingredient is prepotent over the rest, and the prepotent items are received from some element of *interest* to the personal consciousness or organism." And all elements of interest, as I have tried to show, can be reduced in their lowest physiological terms to an increase of self by spending self, or to a spending of self for the increase of self, and through rest to a perpetual increase of the operations of the law.

(ix.) The operation of association depends entirely upon one, and very much upon other, certain conditions of mind and brain, which, in their related order, could be shown to be dependent in themselves and their effects upon the same law. They must be simply named, however, and the inference drawn from what has already been said. These conditions are as follows :—

(1) The principle of constancy in the mind's meanings, whereby " the same matters may be thought of in successive portions of the mental stream, and some of these portions can know that they mean the same matters which the other portions meant." This is the absolute condition.

(2) Automatism and habit, recency and vividness, congruity of both emotional and physiological tone. These are the modifying conditions.

At the present day it is agreed by all psychologists that all the higher operations of the mind are carried on by means of association with attention operating according to its laws. Such, for example, as *memory*, *expectation*, *constructive imagination*, *judgment*, *reasoning*, and *generalisation*.

To these must be added transferred feelings of *pleasure* and *pain*, *benevolence*, *conscientiousness*, and, finally, all the generalisations of science, of ethics, and of religion.

In these prolegomena to a philosophy of medicine there is no opportunity to point out how all these higher experiences are related to the law of life. The illustrations given, however, may be sufficient to enforce a preliminary recognition of such a law.

In a full treatment of the subject an adequate exposition of the law in all its bearings would be required.

CHAPTER IV.

Inferences from the Bio-dynamic Law.

§ 1. If I have adduced sufficient evidence to enforce the recognition of a bio-dynamic law, we are in a position now to consider its relationship to the ordinary conceptions of health and disease.

A person may be said to be in full health when the law of life has the fullest operation consistent with the structure of the body—that is to say, when the resting and active states relatively balance each other. In the resting state the body will be in a condition of unstable equilibrium, ready for the capacity for increase by exercise to be manifested in any direction. The individual will be refreshed by rest of any description. Waking from sleep will be attended with manifest pleasure in anticipation of a possible increase of life, and, in fact, of that increase already begun. Exercise and increase will ensue, with pleasure in their results, rest will follow, and the round be commenced again. This is ideal health, and pre-supposes external and internal conditions to favour it entirely.

§ 2. If these external and internal conditions do not favour it entirely there will be a departure from health. In some degree, however slight, the equilibrium of the resting state will be disturbed, and the increase by exercise will become out of due proportion in different parts, and be unattended with pleasure if not attended with pain. There cannot, however, be a departure from the law of life as long as life is not destroyed. If this law could be abrogated it would not be a law. The external and internal conditions which do not favour the well-balanced operation of the law are the causes of disease. They are legion, as is well known, and a study of them is a science in itself. Disease is con-

stituted by the reaction of the law of life against these causes, it is the effort of the law of life in the face of conditions which tend to the destruction of life instead of its maintenance and increase.

§ 3. A distinction has been made between these conditions as external and internal. If a group of external conditions has induced an ill-balanced operation of the law of life, some structural alteration may be the result, and this in its turn may be an internal cause of some further disease. Such internal cause may lead to mechanical or chemical defects, which in their turn may lead to further structural and functional defect.

§ 4. The phenomena observed as the result of the reaction of the law of life against the causes of disease, in their co-existence and sequence, truly vital, mechanical and chemical, are termed the *clinical history* of disease: the structural alterations which are characteristic of it, the *morbid anatomy*, and the interaction of the law of life with the internal causes as far as it can be observed and generalised upon, *pathology*.

§ 5. It is obvious that the causes of disease are immensely more numerous than the conditions of health. Every phase of disease which can be observed is observed as a departure from health of the particular individual who is manifesting these phases.

The recognition of the disease, in its clinical history, morbid anatomy, and pathology, as related to the degree of health it displaces, and as related to all other phases of disease that are known to have occurred, is termed the *diagnosis* of the disease.

§ 6. A classification of disease to be natural follows the anatomical and physiological order (primarily the resting and active normal states of the organism), beginning with the most general of all, caused by some morbid poison, and ending with new growths.

Sub-groups are formed following more special anatomical and physiological divisions, naming the disease, first, according to the manifest pathological state, and, secondly, as to the supposed pathological or external cause.

§ 7. Recovery from disease takes place when by its own effort under the ordinary conditions which maintain health, the law of life is able to resume its balanced capacity to the full.

The tendency to recovery was formerly called the *vis medicatrix naturæ*, but it may be observed to be part of the action of the law of life against the causes of disease.

§ 8. An estimation of probability of recovery arrived at by a comparison of the full diagnosis of the disease with what remains of health in the organism is termed the *prognosis* of disease.

§ 9. If the causes, external and internal, of disease can be voluntarily removed or altered in their effects from without, either by a modification of the ordinary conditions of health (hygiene), or by the application of a substance externally, or the introduction of any substance internally capable of altering the balance of the law of life in its full capacity (therapeutics), or if mechanical operative measures are brought to bear on the structure of the body (surgery), these processes, one or all of them, are comprised under the *treatment* of disease.

§ 10. A recognition by the mind of the universal operation of the law of life will serve the widest philosophical or explanatory purpose in *the knowledge of disease*, in its *causation, clinical history, morbid anatomy, pathology, diagnosis, prognosis*, and *treatment*.

This statement might be illustrated by reference to a single disease such as pneumonia, or a malignant new growth. Let it be suggested to anyone who will undertake the task to read the notes of a concrete case of either of these diseases, or a text-book description of them, in the light of this law, and it will be noticed how explanatory a knowledge of it will be all along the line.

Take the instance of a new growth. Why is it malignant? The law will explain that the structural elements are so much like the normal structural elements of the organism, and the processes of growth so nearly allied to normal processes of growth, that given the cause of heredity in a certain individual, which is itself an illustration of the

law, the reaction of the law against the spread of the disease is reduced to a minimum. It is almost like the law of life operating against itself for recovery to take place from a fully-developed cancer. The law of life operating against itself could only be death.

Another point, however, should be noticed. Malignant disease occurs in the tissues which are next less highly organised than the tissue of the nervous system, hence it might be presumed that there would be some reaction against the progress of the disease, which is, indeed, the case. And this reaction is in proportion to the vigour and tone in which the nervous system is able to continue. Note, too, the inferences which our law gives to the general principles of the treatment of malignant disease. Early and complete removal of every vestige of the growth, and of any infected foci of contagion, a maintenance of the health of the patient, as far as this can be made vigorous under the circumstances, and a placing him under the most favourable external conditions, mental and bodily, for the continuance of health.

§ 11. (i.) The wide, new, and fascinating science of *bacteriology* as a branch of biology might afford many illustrations of the operation of the law of life, but they would be out of place in this connection.

Two or three points may be referred to: The relative simplicity of organisation, weakness of natural activity of the single organism of bacteria, makes their propagation by self-division so much the more easy if a suitable nourishing material is provided for them. On the other hand, if this nourishing material is denied them, their propagation is reduced to a minimum, and known substances are capable of destroying nearly all of them. Thus they occupy the lowest standard in the scale of living beings, and in view of the multitude of their forms and habitat, they would occupy a relatively balanced position in relation to the causes or recovery from disease and so, indeed, they do, as witness the phenomena of phagocytosis.

(ii.) It is, however, as causes of disease that bacteria offer the widest field for investigation and speculation in relation to medicine. The whole theory of infection is based

upon bacteria, and as this covers the ground of more than one generation, the process of infection is by no means an easy one to understand. Our law will aid us, however, by discriminating in a given disease or case as to what belongs to the life of the bacteria and what to the life of the infected individual. This point is a most important one in the history of all infectious diseases, but more especially in the history of tuberculosis. Perhaps less than in any other disease, the pathology and morbid anatomy of tuberculous disease does not belong to the life of the tubercle bacillus, but is an organic result of that bacillus acting as an incentive to the life of the organism which it infects.

(iii.) A knowledge of the law of life, too, will aid in the treatment of infectious disease by effecting a discrimination between the measures to be employed for destroying the micro-organisms, or staying the process of infection, and the measures to be adopted for aiding directly a recovery from the effects of the infective cause.

§ 12. (i.) *The Science of Pharmacology*, which may be held to include both pharmacodynamics and drug pathogenesy, occupies a most important position in the philosophy of medicine.

A distinction must be drawn as to the use of the two terms pharmacodynamics and drug pathogenesy. *Pharmacodynamics* is not a branch of biology, except in so far as some drugs have their orderly place in botany, and a certain behaviour when subjected to preparation before being administered to healthy life. These points, along with their chemistry and the chemistry and physical qualities of non-organic substances, constitute the true science of pharmacodynamics. On the other hand, *drug pathogenesy* is a true branch of biology, or physiology, more strictly speaking. In its origin scientifically, drug pathogenesy is an off-shoot from the science of symptomatology and pathology, although experimentally it has been derived from the common-sense employment of drugs in the treatment of disease.

(ii.) Hahnemann was the founder of the science of drug pathogenesy. It arose from a discontent with the prevalent common-sense medicine of his day, and a perception that

unless the effects of drugs were known in themselves from having been administered experimentally in the healthy individual, no accurate, or definite, or reliable inference could be formed for their use in disease.

The paragraph in the "Organon of Medicine"[1] enforcing this truth, deserves to be quoted in full. It is as follows: "There is, therefore, no other possible way in which the peculiar effects of medicines on the health of individuals can be accurately ascertained—there is no sure, no more natural way of accomplishing this object, than to administer the several medicines experimentally, in moderate doses, to *healthy* persons, in order to ascertain what changes, symptoms, and signs of their influence, each individual produces on the health of the body and of the mind; that is to say, what disease elements they are able and tend to produce, since, as has been demonstrated,[2] all the curative power of medicines lies in the power they possess of changing the state of man's health, and is revealed by observation of the latter." In a note to this paragraph Hahnemann named one other physician—Albrecht von Haller—who had thought of this plan; but in the next paragraph he says that he himself was the only one who had pursued it with perseverance. In § 110, Hahnemann affirms that known cases of poisoning by drugs afford additional information in the realm of drug pathogenesy; and in the present day, experiments on animals have been extensively made with poisonous doses, with a view, if possible, to ascertain the deeper action of the drugs in question. As to how far the results of experiments on animals can be taken as equivalent to similar results being expected on the human subject is an open question as yet; but the well-proved position of practitioners of homœopathy, that they can be corroborative merely of ascertained results in the human subject, is the only safe one. And the safety of this position is affirmed by the most various effects from bacterial infection observed in different animals by inoculation with the same micro-organism.

(iii.) What is the relationship of the law of life to the

[1] "Organon of Medicine," translated by Dudgeon, 1893, § § 108, 109.

[2] *Ibid.*, § § 24-27.

effects of drugs? First of all, it teaches that the *action* of the drug cannot be discovered from any inherent dynamic *effect* that it has. This action may be either chemical or physical, but whatever the effects may be, they are the effects of a reaction of life upon the action of the drug. And in no sense of the word are action and reaction in this case equal, any more than the reaction of protoplasm, or of organised life, is equal or opposite to the stimuli which are a condition of its life. The conditions of life as stimuli, all the multifarious drugs which might be proved on the healthy, or observed as poisons, or used in experiments on animals, can separately be compared in themselves, classified in their quantitative, mechanical, molecular, physical, and chemical relations; and so, indeed, can all the observed effects of the operation of these natural or artificial stimuli on the organism be compared and classified; and the two groups of causes and effects may be compared, but, *in no sense of the word*, can the effects be said to be the result of these causes unless an account be taken of the reaction of the organism upon these stimuli, by means of the operation of the law of life.

(iv.) An assumption of this position through the recognition of a separate law of life, disposes of the notion of the opposite *action* of small and large doses of drugs.

That they may have primary and secondary effects is another matter, and it is to be expected that they would have primary and secondary effects.

A drug is not a drug, if in a moderate dose it does not cause some symptoms or signs in the organism suggesting disease. These may be slight and quickly pass away, but if the stimulant in the nature of the drug has a more violent action, although this cannot be known, the action of the organism is perceived as both action and reaction, which in pure physics are equal and opposite, but in physiology partake of contrasted effects, which in their successive groups appear as one group opposed to the other. The terms primary and secondary in pure strictness can only be applied to groups which seem directly dependent on each other in their order of appearance. Thus they may be associated with one organ or function, or with one part of that organ or one phase of its

function. These terms, however, may be used in a very much broader sense. They are applicable to groups of effects which may form the whole content of a science of drug pathology. Suppose, for example, a hæmorrhage results from an ulcer in the duodenum caused by poisoning by the *bichromate of potash* or *nitrate of uranium*, and the patient suffers severely from the mechanical effect of blood in the intestine, and from the dynamic effect of being deprived of blood-pressure, pabulum supplied to the tissues, or oxygenated hæmoglobin. It would be incorrect to say the symptoms due to the hæmorrhage were symptoms due to the drug, yet they might be most important in the history of the patient's state. This is an extreme case and might not lead to much confusion in the orderly conception of the effects of the drug in the mind of the observer. But what are we to say of the effects of antimony, arsenic, iron, mercury, lead, silver or phosphorus on the animal economy? Their pathogenesy is mixed up with primary and secondary, functional and structural, direct and indirect effects, which in their co-existence and sequence, dependence and interdependence, is a science in itself.

(v.) Why certain drugs should have an affinity for certain organs or tissues or functions of the body is by no means yet explained. That they have this affinity is undoubted, and it is acknowledged by many modern observers in pharmacology, although they do not recognise its full significance for therapeutics. Efforts are continually being made to explain this affinity by chemical analogy and theory, but as the chemical equations of protoplasm and all the formed material of the organism are not yet discovered, any explanations of pure pathogenetic effects, from the chemical point of view, at present lack the major premise to a satisfactory conclusion.

It is in the sphere of chemistry, however, that we may anticipate eventually a solution of this problem, but what a portentous knowledge the explanation will involve! And when we have it, how many principles and considerations will have to be taken into account in the application of a chemical theory in the *usus in morbis*. And suppose, too,

a chemical theory is forthcoming, will the pathogenetic theory be set aside? Not at all. The chemical theory will be simply brought into relationship with it, and it is safe to prophesy, I think, that a theory based on pathogenesy will continue to be the more reliable guide in therapeutics.

(vi.) Granting the principle of drug affinity for certain organs, tissues and functions of the body, in view of the universality of the one law of life, amid the diversity of form and result in which it is manifested, it is not difficult to anticipate that different individuals with different temperaments, idiosyncrasies and susceptibilities, would exhibit different shades of reaction to the influence of the same drug. These different shades of reaction have been termed *contingent* effects as distinguished from the invariable effects which are called *absolute*.

It may be added that this distinction between the two classes of effects has been carefully worked out by two prominent writers among homœopathic practitioners—viz., Drs. Drysdale and Hayward. A good account of the subject will be found in "Materia Medica, Physiological and Applied." What I wish to remark upon more especially is the scientific value placed upon contingent effects. It is argued that as indications for the use of a drug in disease, these contingent effects, though of corroborative value, are of higher value than the absolute effects. And for this reason,—that what occurs as a real effect in one individual, presupposes the power of the drug to produce the same effect in all.

On what but a universal law of life this conclusion could be based it is impossible to conceive. The contingent effects of drugs, however, could scarcely become admitted facts of drug pathogenesy unless they had occurred in two or more persons. Otherwise, as no two persons are absolutely alike, some peculiarities of the idiosyncrasy might be put down as drug effects which had nothing whatever to do with them.

Every fact set down as a drug effect must be capable of being proved to be a drug effect, or reliance placed upon it may prove to be delusive in the highest degree.

§ 13. (i.) The broad subject of the *Treatment of Disease* has been, by a brilliant writer, Dr. Carroll Dunham,[1] clearly marked out into two sections—therapeutics and hygiene. Therapeutics consists in the treatment of disease by drugs, and measures adopted other than this partake of the character of hygienic measures, as they consist of a modification of the ordinary conditions of the patient's health. It is only within the last few years that the British Medical Association has devoted a special section of its work to pharmacology and therapeutics. At the first annual meeting of this section in 1884,[2] Dr. T. J. Maclagan, the president of the section, laid down the following principles for the guidance of the section. He grouped his remarks under two heads, viz.: 1, Methods of therapeutic research; and 2, Points necessary to scientific inquiry as to results of treatment. Under the first head we have given: (1) Experiments on the lower animals, (2) Statistics, and (3) Individual observation at the bed side. Under the second heading he gives: (1) Accurate noting of all symptoms throughout the course of disease, (2) A statement of the constitutional peculiarities of the patient, (3) Details of the mode of application of methods of treatment, (4) Details of comparisons of different methods. To men who, for a considerable part of their lives, have been familiar with the method of Hahnemann, these points seem poor and meagre in the extreme. But really, in view of the chaotic state of drug treatment at the time of the inauguration of the therapeutic section of the British Medical Association, they contain some excellent principles, which might serve as a foundation for a science of therapeutics. Of course we shall not forget that Dr. Maclagan, as the custom was and is, simply ignored Hahnemann and his work, and the history of homœopathy since his time.

(ii.) When, in many generations to come, a historian writes an account of medical progress through the ages, the pages recording the theory and practice of the nineteenth century will be branded with shame. The leaders of medicine in this century have seen only the mistakes of the

[1] "Lectures on Materia Medica," vol. ii., Philadelphia, 1886.

[2] *British Medical Journal*, vol. ii., 1884.

man of surprising genius and unhesitating speculative daring, who, a hundred years ago, founded scientific therapeutics. Had it not been for his capacity for, or even the certainty of his making mistakes, Hahnemann never could have given to the world the suggestion that drugs should be used in diseased conditions similar to what they were capable of causing in health. Even now it seems that this suggestion has been given to the world almost a hundred years before its time. That Hahnemann, in the absence of any defined law of the phenomena of life, should have been able to arrive at the generalisation of the rule of similars, speaks volumes for the range of his observation, his critical acumen, the broad basis of his discriminative power, and yet for the patient pursuance of the smallest detail of scientific research. He has set a grand example to his disciples and indeed to all leaders of medicine to follow in his train.

(iii.) Hahnemann gave some explanations of the rationality of the employment of the rule of similars. These have been very ably summarised by Dr. Madden,[1] in his Congress address, so that I need not repeat them; and, as Dr. Madden suggested, in the light of present day knowledge they cannot be accepted. Notwithstanding, however, that Hahnemann's explanation of the *rationale* of the rule of similars fails to be correct, in response to his example, the rule has been tested by the experience of thousands of men of unquestioned capacity; and in the estimation of those who have faithfully tried it, it stands higher far than any other principle that could be adopted for the administration of drugs in disease.

(iv.) Does the law of life that I have been illustrating afford a clue as to the *rationale* of the application of this rule? I think it does. It will be remembered that I tried to enforce this truth: *That life takes advantage of fine shades of difference for the increase of itself.* This is observable from the very beginnings of life upwards to the highest scale of thought. We saw it in the phenomena of reproduction by cell division, in the process of fertilisation, the whole phenomena of sex being an illustration of it, and in the early changes which

[1] *Monthly Homœopathic Review*, October, 1895.

take place in the ovum. Its influence could be traced all through the process of development, in the variety of histological element, as well as in naked-eye morphology. To it we owe multiplication and symmetry of form, and diversity of function in all directions. A large number of experiences of daily occurrence might be brought before you as illustrating this truth. I will only mention two or three. Supposing you have been listening intently to an address, and fixing the eyes for some time on illustrations, a state of fatigue ensues, which eventually, in spite of an absorbing interest in what is going on, makes itself felt in consciousness. The slightest movement in the chair, or a rubbing of the eyes with the hand, or even closing them tightly for a few seconds, will bring about a change and relief to the sense of fatigue, so that attention may still go on for a further length of time. Or, suppose one is reading a story, and the author leads the reader along well-worn channels for most of the way, until in the course of the plot, he introduces a slight new feature, which influences the subsequent course of events in a way that was not anticipated. Directly this new feature is observed, a thrill of fresh interest arises in the mind of the reader, which casts its glow over the whole picture. Or again, if in the course of a series of scientific experiments, some slight new result is attained, not significant in itself, but correlated with other results, the interest supplied by this new feature is extended all along the line. I need not multiply instances, but proceed to apply this truth to the subject in hand.

We must remember the law of life never ceases its operation until extinguished into silence by actual death. While life lasts, notwithstanding the virulence of the disease, there is still some vestige left of the operation of the law of life. By the use of drugs, a set of stimuli of a different order from the normal stimuli of healthy life, and different from the causes of disease, are brought to bear on the organism, to which it is bound to make a response. If a stimulus of this kind is applied in the course of disease, which, given in a sufficiently large dose in health, would cause a condition similar to the picture and course of the disease—what is

likely to happen? Simply, that the *law of life*, or the *vis medicatrix naturæ*, or *the organism*, if you like, will take advantage of the shades of difference in stimuli, and make a larger effort to increase itself; or, in other words, to return to health. It is the shade of difference in the stimuli between the cause of the disease on the one hand, and the dose of the drug exercising its affinity and causal relationship on the other, which is the essential point to keep in mind as an explanation, while the similar relationship is the guiding principle for the selection of the medicine.

(v.) Let me point out under a few heads how many features which, by experience, are regarded as essential to the success of homœopathic treatment, are explained by a recognition of this truth :—

(*a*) The removal of the external cause or causes of the disease. If these remain, the appropriate drug will be sure to fail in its effect; it will be neutralised as a stimulus to healthy action.

(*b*) Rest or exercise of the particular organ, or organs, as may be called for according to the nature of the disease process. These are emphatically hygienic measures, which would favour the organism taking advantage of a drug stimulus of the kind referred to.

(*c*) Limitation of the dose of the drug to one below that required to produce its physiological effect, or else two similar diseased states might be produced; one could not be an aggravation of the other, however, only *an aggravation of the sufferings of the patient.*

The limitation of the dose, however, must not be pursued so far that there is danger of the patient not having any medicine at all. This question can only be decided by two lines of inquiry: (1) By experiment as to how far drugs can be divided by mechanical means, and yet have some of the substance remaining in the vehicle of division and administration. (2) By a collection of authenticated cases where drugs have been administered in a very high state of dilution, and the effects noted and compared with those which have had other doses administered, and with those which have had none at all.

(*d*) A frequency of repetition of the dose, corresponding to the length of time each dose takes to exhaust its effect. If the dose be too frequent the organism becomes tolerant of its effect, and the drug ceases to be of use. Generalisations on this question can only be made from clinical observation, and by the careful record of facts over a large number of cases. A required frequency of repetition, too, will vary much with the disease in its character, course, progress, intensity, and prognosis, and with the same disease in different varieties of temperament and degrees of susceptibility to external influences.

(vi.) The explanation which I have suggested will throw light also on some inductions of Hahnemann relating to the observation of disease as a guide in the selection of the remedy.

(*a*) The totality of the symptoms constitutes the disease for the purpose of a cure. Symptoms in preference to the effects of the disease, such as the morbid anatomy, I take it to be meant here. As it is the condition of the patient, rather than the condition of the disease (which is an abstraction of the mind), it is desired to influence by the drug, the symptoms offer a far truer guide to the quality and degree of the reaction of the law of life against both the causes and effects of morbid processes, than the causes and effects themselves. Let me illustrate this point by an example. Take a case of empyema coming for the first time under observation, and diagnosed as such. If any benefit is to be derived from drugs in such a case, it will not be by treating the collection of pus in the pleural cavity as such, which would be absurd, but by giving a drug which shall have a similar relationship in its pathogenesy to the symptoms presented by the patient under treatment. If a drug should have caused such a thing as empyema this fact would, *cæteris paribus*, be an additional indication for the use of such a drug. Of course, the primary and immediate indication in the treatment of such a case would be not by drugs at all, but by the evacuation of the pus and the cleansing of the pleural cavity; but if there is any truth in the law I have been trying to enforce, in addition to the

surgical procedure required in this case, the patient will be helped by the administration of drugs according to the rule of similars. That is, if the symptoms depending on the original cause of the empyema are taken into account, the presence of the pus as a symptom, the symptoms of dyspnœa, hectic, &c., depending on the presence of the pus, and a prescription made on these. And a fresh prescription will be required after the pus has been evacuated and the cavity cleansed, because the condition of the patient will be altogether different.

(*b*) The second induction of Hahnemann I wish to allude to is that the most peculiar and most characteristic of the symptoms out of the totality, particularly those appertaining to the mind, are the more important for the guidance of the physician in the choice of a drug. Let me still illustrate my argument by the pursuit of the illustration of an empyema case. A case was sent into the London Homœopathic Hospital last year; it was the result of a very severe attack of influenza, and had been under my care for three weeks, the empyema having been diagnosed a few days before the patient was admitted into the hospital. The patient was a lad of 18. Immediately on admission about fifty ounces of pus were evacuated from the pleural cavity by Mr. Knox Shaw, and the patient was put back to bed. I do not know what medicine was given, but I know that in a day or two afterwards the patient developed hæmaturia, and albumen was noted in the urine for some days or weeks afterwards. The patient also was very quiet, depressed, and irritable. These symptoms were doubtless due to the poison of influenza, but the point I want to emphasise is that in this particular case the occurrence of hæmaturia became a most important indication for an entire review of the patient's condition as far as the drug treatment was concerned, not because it was necessary to treat the pathological state of the patient's kidney, but because the occurrence of the hæmaturia afforded an extremely suggestive and important indication as to the influence of the influenza poison, and by contrast to the behaviour of the organism under it, and by contrast still, it was an important indica-

tion for a drug, which should have this as one of the characteristic symptoms in its pathogenesis. I do not know what treatment was adopted in this case, but under the skill of Mr. Knox Shaw and Dr. Moir, the young man completely recovered.

Why mental states should have an important relation to the symptoms of disease can only be understood by the recognition of a law relating both mind and body conditions. As we saw that in *mind* the law of life operates in its entirety, the induction of Hahnemann, that mental states are exceptionally important indications as to the whole bodily state, becomes verified by deduction.

(vii.) The explanation I have been offering of the operation of the rule of similars, also throws much light on the scope and limits of its value in the treatment of disease as at present understood. It is in the large class of functional disorders, which arise from an impingement upon the organism of unfavourable conditions from without, and yet do not give rise to any actual change of structure, and tend to regular and complete recovery, that the method will be most easy to apply, and the organism be most quick to respond to its influence.

The dividing line between functional and structural disease is difficult to mark, but if the knowledge of a single law of life has much influence over the knowledge of diseases, it will determine a much larger number to be regarded as functional than has hitherto been the case. I offer the instance of pneumonia as an illustration for speculation upon the subject. Where, under the influence of heredity, the specific poison of syphilis, or some other long-continued unhealthy condition of mind or body, actual degenerative changes have taken place, or new growths have ensued, there can be little expectation of cure by the operation of the rule of similars. Much, however, may be accomplished by way of relief to conditions which result from the degeneration or the new growth, the principle of treatment being to enable the organism to take advantage of any external stimulus to its normal activity and resistance to the process of disease. Here, again, the symptoms are the

guide, provided a careful and accurate discrimination is made between them, past and present, dependent and interdependent.

(viii.) The explanation I have been offering opens up, however, the prospect of new fields of conquest far beyond those at present reached. If the organism invariably takes advantage of shades of difference for the increase of itself, the method of similars in the treatment of disease becomes capable of almost unlimited development, and we may anticipate that eventually no process of disease actually in progress and where death of parts or the whole of organs has not taken place, will fail to be brought under its influence. Under this head the whole question of treatment by nosodes and inoculation by cultivations of micro-organisms, which is still in a nebulous state, will come under consideration.

(ix.) And if this law holds good for the recovery from disease, will it not also hold good for its prevention? In his address at the Congress, Dr. Madden instanced many current views under this head, and which seemed to be analogous to the operation of the rule of similars. My argument, I believe, throws light upon them all. When the organism has once passed through the ordeal of an acute specific disease, it is usually immuned from a second attack. Why? Because of the law of self-increase by exercise. The distinctive peculiar poison in question offers such a different stimulus to the organism from its ordinary conditions, such is the degree of reaction by the law of life, that if the same stimulus is offered again, the organism is proof against it; and that the reaction once offered to this peculiar poison is so universal and intense that it covers the whole life of the organism now and for the remainder of its existence.

Not everyone, however, is immuned from a second attack of any disease, and this arises, as is well known, from a difference in the susceptibility of single individuals as distinguished from the majority. In order to illustrate this point, take an example of contrast which, by way of cause, comes perhaps midway between an exaggeration of some

natural conditions of health and an acute specific poison—I mean, croupous pneumonia. If a patient had just thoroughly recovered from acute croupous pneumonia, it would not be anticipated he would have a second attack of that disease immediately following the first, even if exposed to the cause again. True, it would be dangerous to expose him to the cause, but we can imagine a small relative immunity against a recurrence of that form of pneumonia, because its cause has a shade of difference about it from that of simple inflammations of the air cells of the lungs, or of the bronchial tubes. But the poisons of small-pox, scarlet fever, or measles are so specific, so peculiar, and affect the whole organism so thoroughly, that (to strain a point) we should require it to renew its youth before it would be affected by an onslaught of these poisons a second time.

These speculations open up so many channels of thought that one would fain pursue, did space permit. They must, however, be reserved. Vaccination may be named as an established procedure for the prevention of disease, as an illustration of the same principle, and, from a slightly different standpoint, the injection of antitoxin serum for the prevention and cure of diphtheria.

What is needed for the development of these methods, and an estimation of their relative value, is time and accurate observation and collection of facts. A principle can only be of value in practice when its limits, as well as its scope, are thoroughly understood.

(x.) Two more points only under the guidance of the law of life I propose to briefly allude to. As the rule of similars is the response of the physician to the natural law of health and disease in its widest sense, so it becomes the most scientific basis for the practice of medicine, and we may truly say that, if faithfully pursued, medicine is raised by it to the position of the finest of the arts. Medicine here, as indeed all curative medicine should, not only touches humanity at its foundation, at its spring, but it also depends for its motive upon the inspiration of that spring.

As yet, however, knowledge is imperfect, and the science of the causation of disease is but in its infancy. It is, there-

fore, impossible to secure the highest results to humanity from the healing art, because the causes of many diseases are still operative and cannot be removed. Accordingly, a pursuance of the science of ætiology, and depending on that preventive medicine, which will progress with far greater strides than hitherto if a knowledge of the law of life is fully grasped, become of primary consideration in the mind of the practitioner. They occupy a major place to that of the intention to cure. Such advances all take time, however, and there are thousands of patients in bed, suffering intolerable pain and dying of incurable disease. What should be done? First and foremost, they should be given every advantage of treatment by the rule of similars carried to its furthest scientific development. But if, on account of ineradicable organic change which acts as an incubus to the organism in its endeavour to maintain and increase itself, and causes untold pain and loss of rest, any or every means that can be known should be adopted for relief, here it is that surgery in all her branches finds her place, and in surgery the great sphere of anæsthetics. But as long as the patient understands their effect and is willing to place confidence in the wisdom and judgment of the physician, anæsthetics are justifiable in medicine as well as in surgery, I fully believe, and so, less measures than those required to produce anæsthesia—anodynes, sedatives, stimulants, counter irritants and anything which allopathy or antipathy may suggest to the mind of the physician, provided he knows what the effects of the means he uses would be if the patient were in health, and if in the full light of a knowledge of the law of life, he allows the halo of the ideal scientific method to cast its glory down his path. And so, too, with the adoption of all measures which in the treatment of disease might be termed hygienic, such as careful dieting, including the use of animal extracts, the use of hydropathic or electropathic measures or the employment of massage. A place for all these will perhaps be found pending the time when knowledge shall have advanced to the point that the cause of all disease is known to its final degree, and when the primary duty of the physician shall be to

prevent these causes operating, and if he cannot prevent them, it shall be his privilege to cure them, *cito, tuto, et jucunde.*

(xi.) One word must be added as to treatment by suggestion. There can be no doubt as to its validity, and that it has its basis in the law of life, and in the predominating influence of the mind over the body in health. As I have stated before, in mind we have the law of life operating on itself, or on its essence, if such a thing can be conceived. And in certain classes of disease, which depend on disordered innervation, either central or peripheral, I see no reason why not, but quite the contrary, that treatment by suggestion should be of great practical service. But theoretically, at least, I fail to see the necessity of inducing the hypnotic state, unless indeed the mind of the patient were excessively morbid. In all cases of treatment by suggestion the mind of the physician must be strong, firm, confident, perspicuous, and broadly benevolent, illustrating the law of life in its highest degree. To pursue this subject further would be out of place, it belongs to the psychology of the future rather than the physiology of the present.

(xii.) From the philosophical position indicated in these prolegomena, I must pass rapidly to a few practical conclusions relating to the work of the Homœopathic Society in the immediate present.

As regards the views put forward in this address, I trust they will be seen to have sufficient cogency and practical bearing to merit attention and criticism; and finally, in whatever form seems most reasonable, acceptance. In the discussions of the sessions later on, there will be abundant opportunity of putting them to the test. I can only say for myself, that ever since I perceived that there was a single fundamental law, operating in the single basis of life, it has given me an insight into the processes of life in health and disease, and has been a guide in treatment, such as I could never have anticipated a possession of. What is the honest thought of one is not his own, for he never could have attained to it had it not been for his fellows.

As a direct result of this thinking, it seems to me that

certain points are immediately necessary to the progress of scientific medicine. The first of these is the improvement of our knowledge of drug pathogenesy. The facts of the *materia medica* still require sifting out from a mass of unverified assertion, which, until verified by competent observers, can never be accepted as fact. I say this in ignorance of what the Index to the "Cyclopædia of Drug Pathogenesy" is yet to be.

Then we need a new presentation of the verified materia, in an orderly anatomical and physiological sequence of arrangement. And, finally, the gaps of unknown regions, of suspected pathogenetic effects, require to be filled up by the systematic re-proving of many drugs; and this to be undertaken in all the light of modern physiological inquiry and method. In therapeutics, cases, cases, cases are required, with the remedies used, recorded, and made the most of in the detail of the record. In a society primarily devoted to that subject, the record of therapeutics does not belong to the *materia medica* section alone; it should occupy its adequate portion of the time of the section of medicine, and dovetail into that of surgery and gynæcology. As regards the special duties of the medicine section, I need scarcely remind you they are common to all societies of medicine. Even though we may possess a method of drug administration which, to a certain extent, is independent of pathology and morbid anatomy, a knowledge of these is absolutely essential to an understanding of the clinical history, than which there is no more important branch of medical knowledge as to what and when and how to apply a remedy.

Accordingly, the more the section of medicine can bring forward cases illustrating unusual points in pathology and morbid anatomy, or unusual occurrences in clinical history, the more useful that section is likely to be.

As to the section of surgery, I scarcely feel myself competent to speak, except that as physiologists, pathologists and therapeutists, we may look to surgeons for side-lights on all these spheres. And so also with gynæcology.

In a great constructive work of engineering skill, in his

drawing of plans and estimation of quantities, the engineer is always bound to reckon on a certain unknown quantity for which the most exact of calculations will fail to account. If this is the case with a science and an art which possess the exactness of the mathematician and physicist, to how much greater an extent is it the case with principles and practice based on the biological sciences, the knowledge of which is based on phenomena which are ever undergoing change. Yet the biologist has one immense advantage over the physicist and mathematician. Although the unknown element in the reckoning of the medical practitioner is almost infinitely greater than that of the engineer, the unknown is invariably offering itself to the effort of his observation, of his interest, and of his understanding.

It is in the transition from the known to the unknown that our Society stands midway. In the present session, as indeed in all future sessions of its existence, may she step still further into the unknown and bring far greater conquests into the known than ever she has done before.

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